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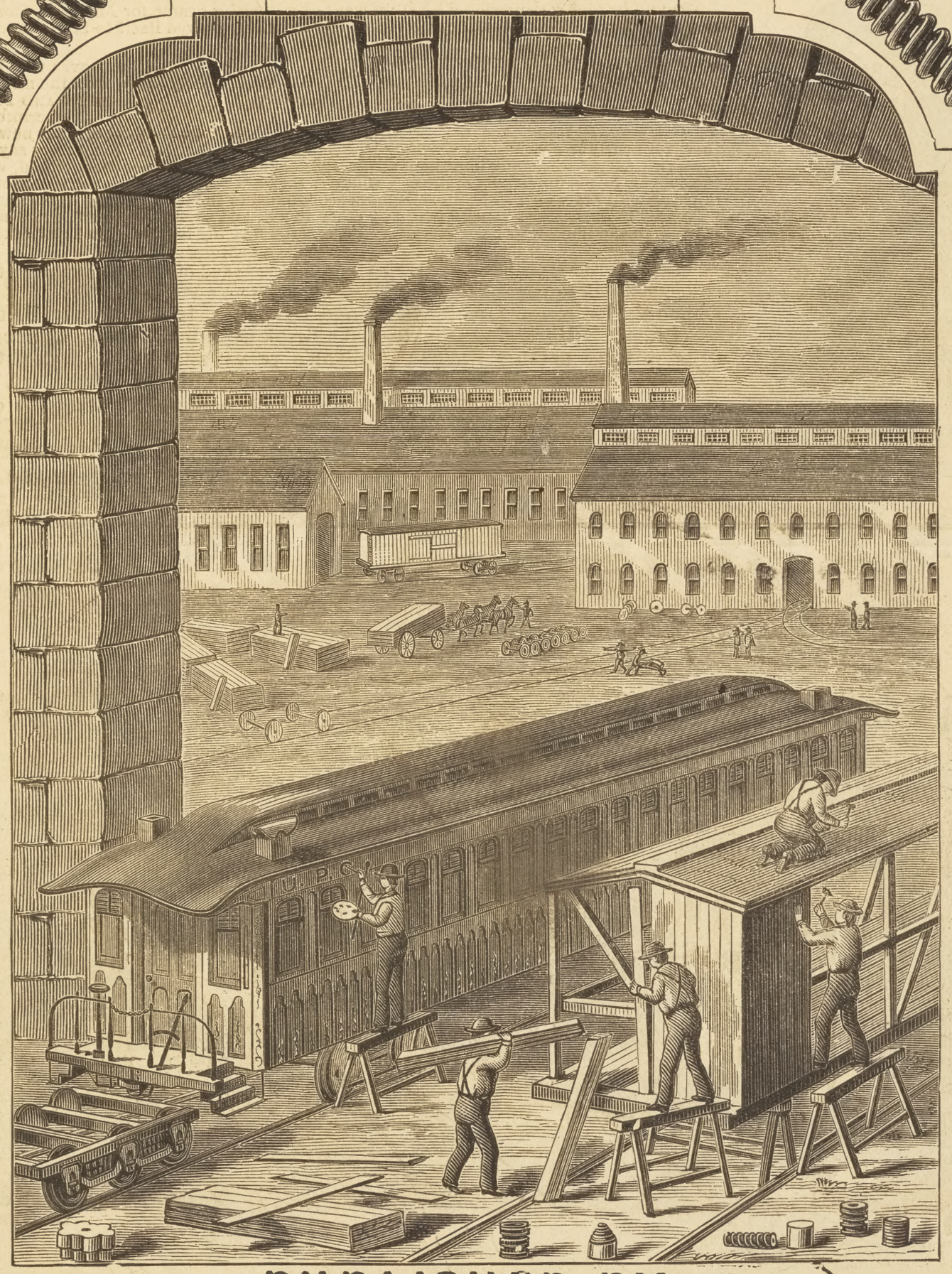
THE NATIONAL CAR BUILDER.

Devoted to the Interests of Railway Rolling Stock.

Vol. V. JANUARY, 1874. No. 1.



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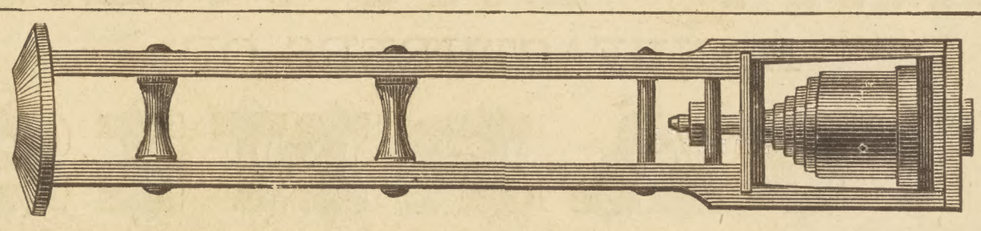

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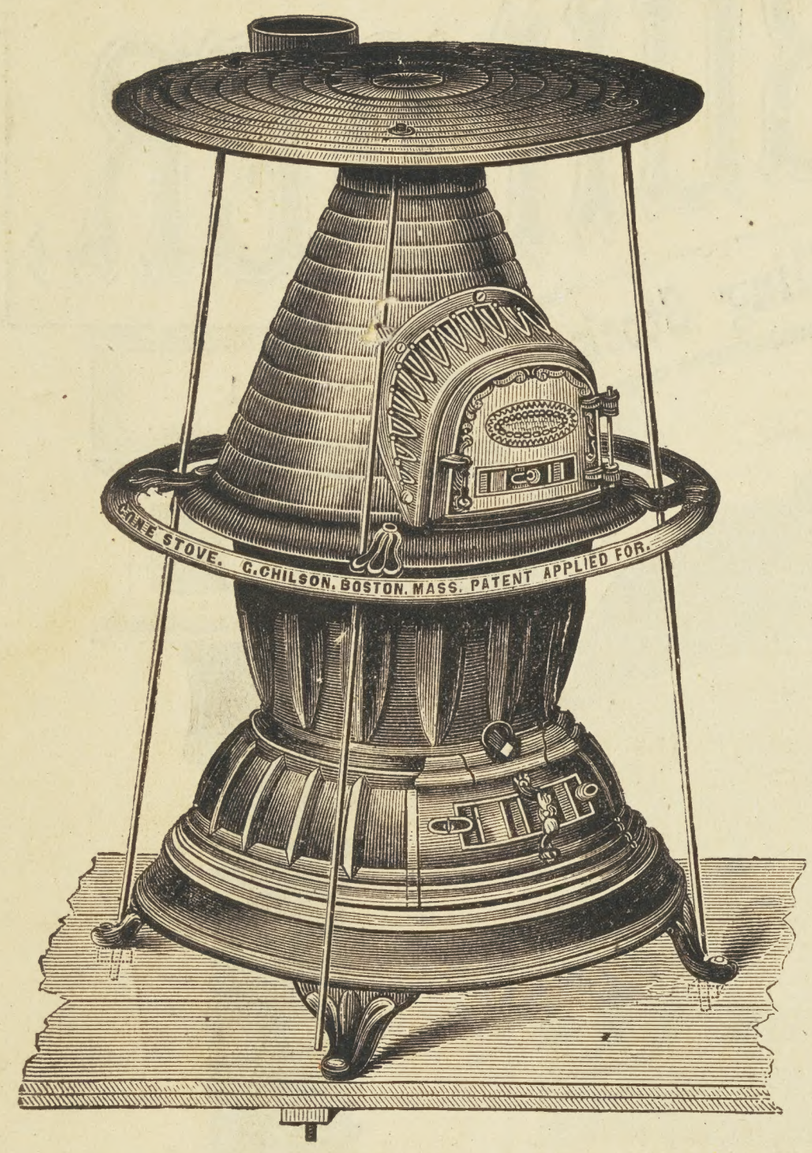
A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

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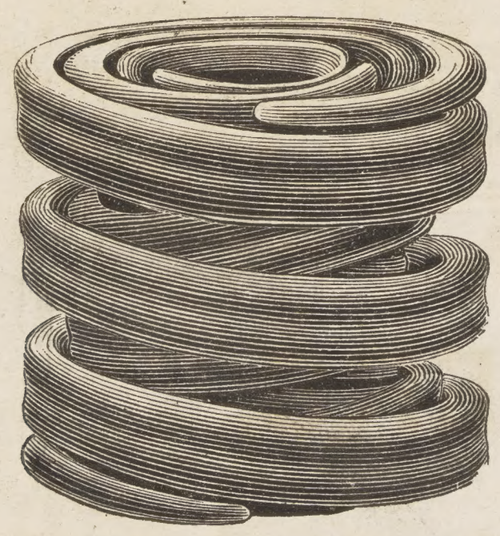

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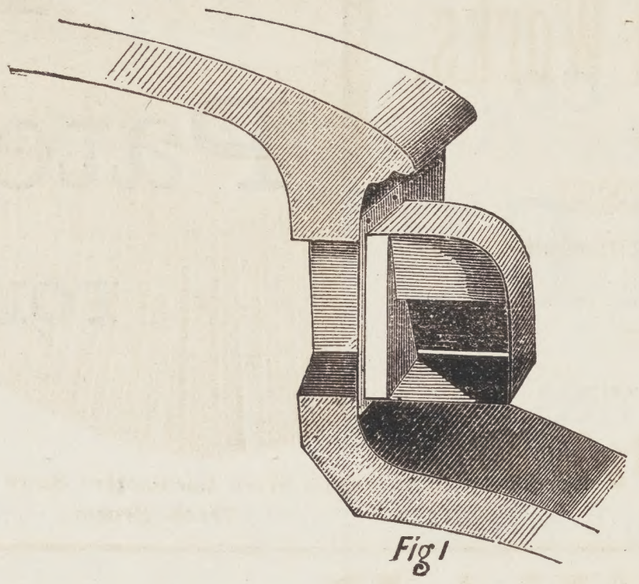

Fig 1

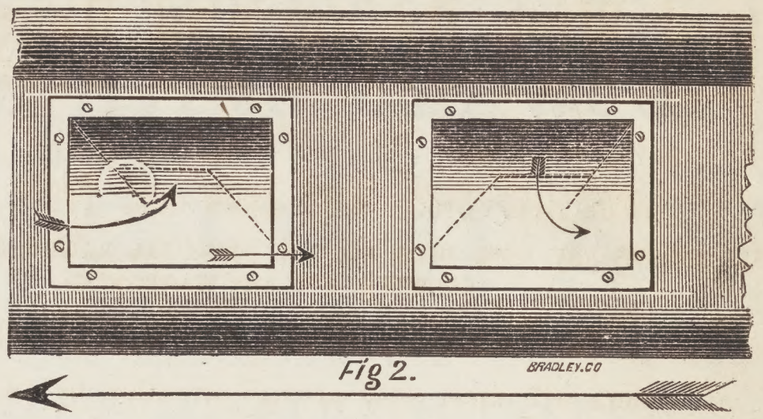

Fig 2. BRADLEY.CO

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

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ROBERT HITCHCOCK, Inventor.

MILLER'S TRUSSED PLATFORMS. Compression Buffers and Automatic Couplers for Railroad Passenger Cars.

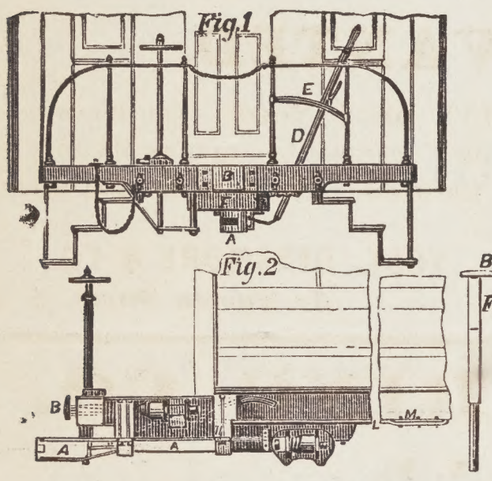

Fig. 1

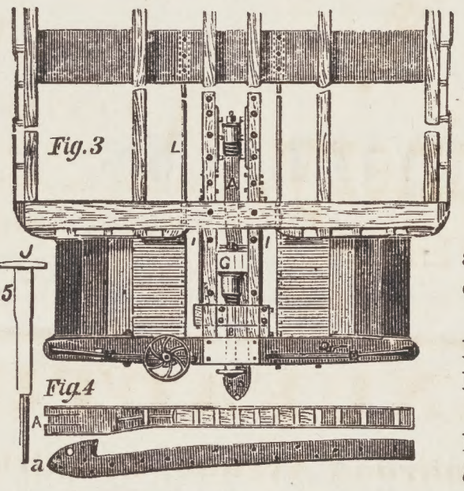

Fig. 3

Fig. 2

Fig. 5

Fig. 4

Office, 231 Broadway, (Rooms 4 and 5,) New-York.

Send for Illustrated Pamphlet, and call and see working models. E. MILLER, Patentee.

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied: and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

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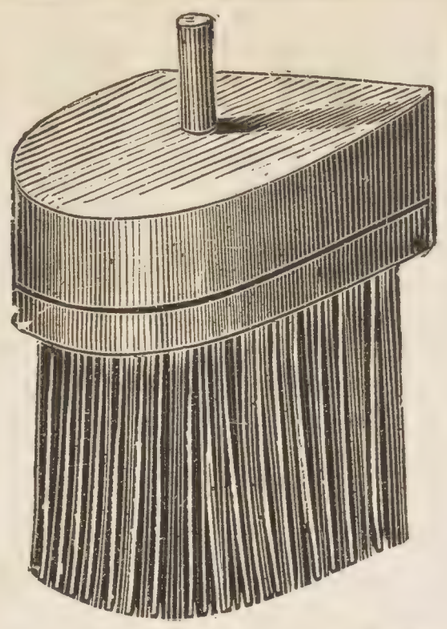

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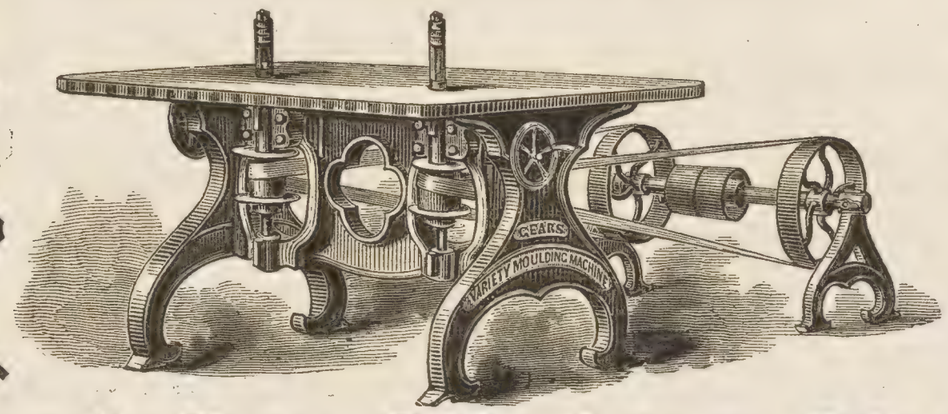

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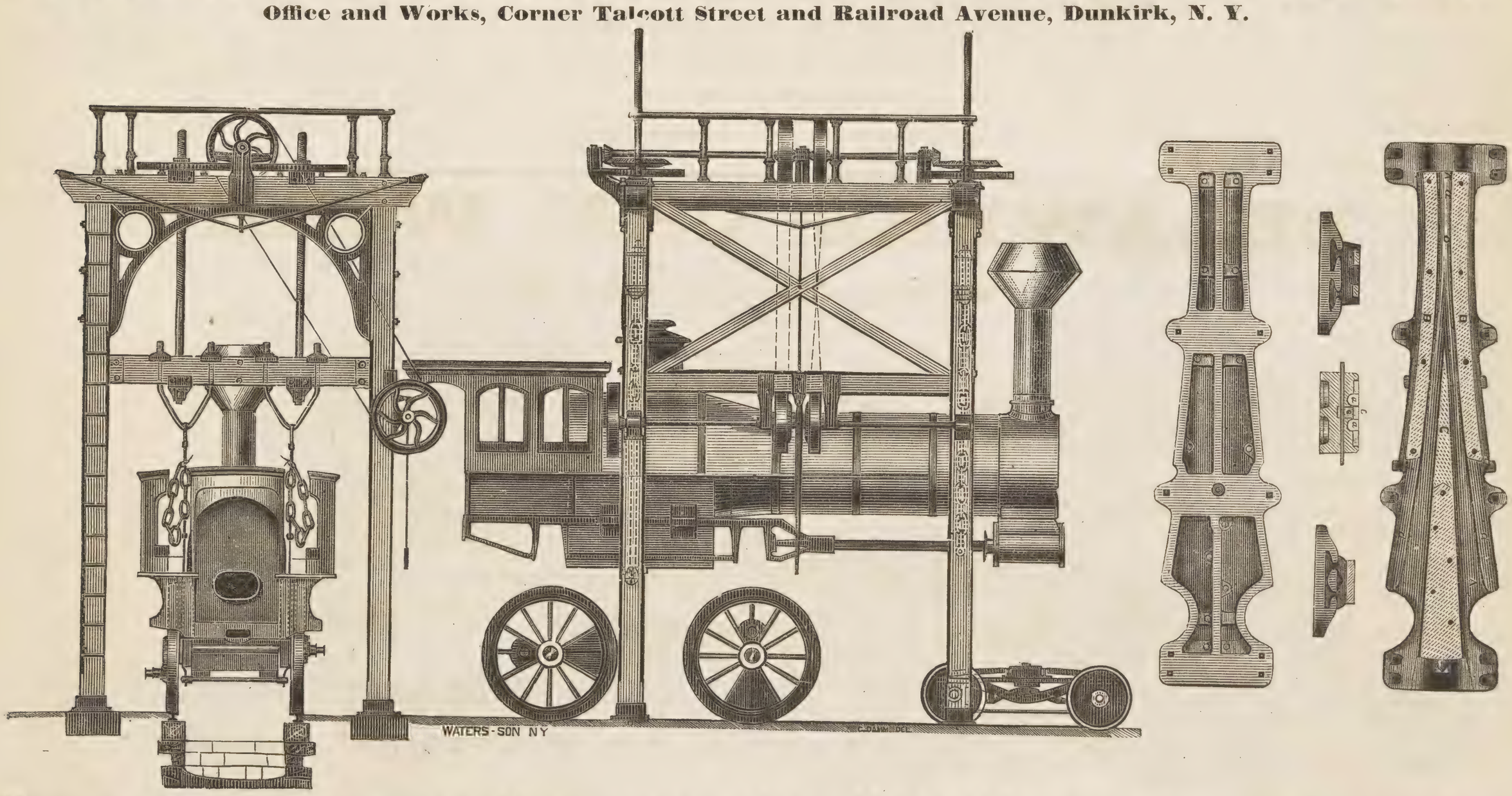

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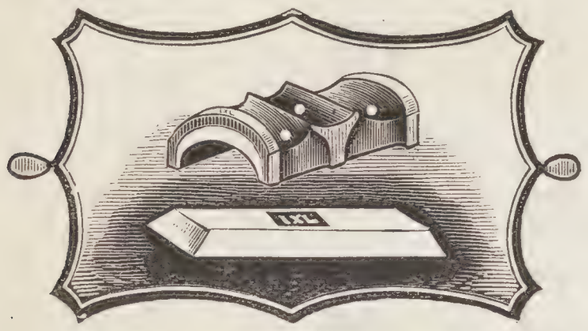

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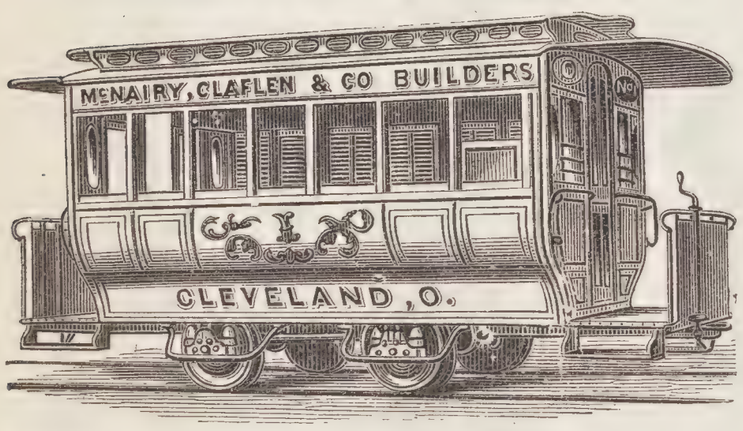

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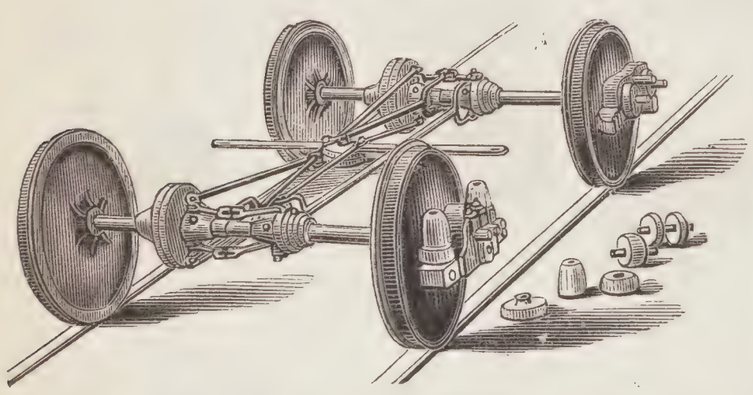

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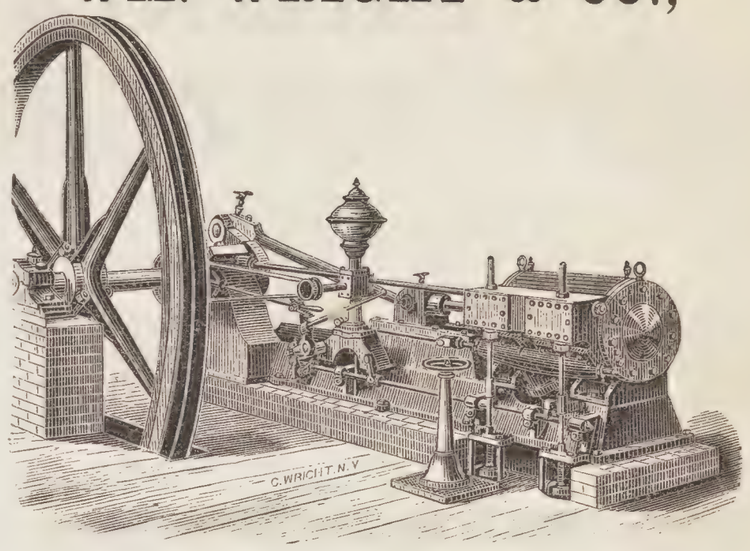

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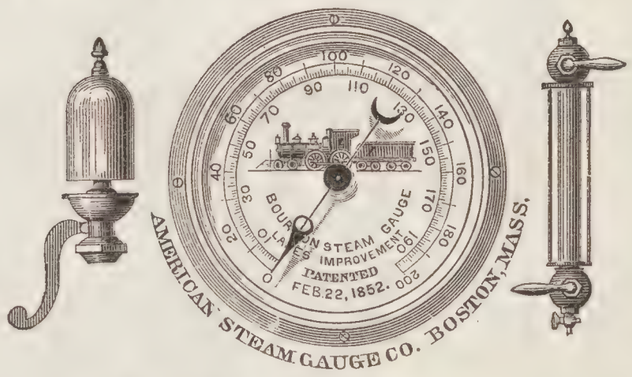

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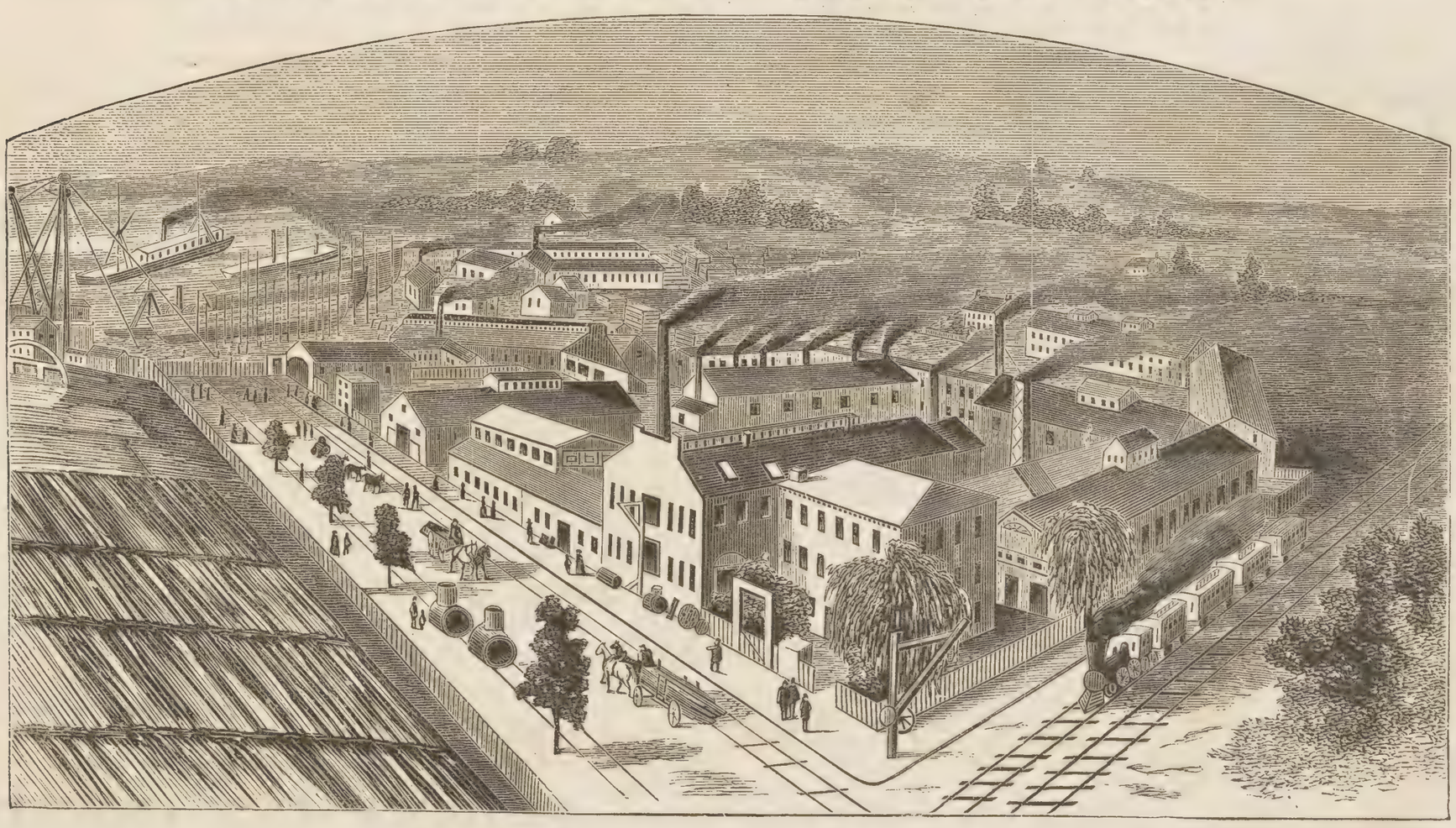

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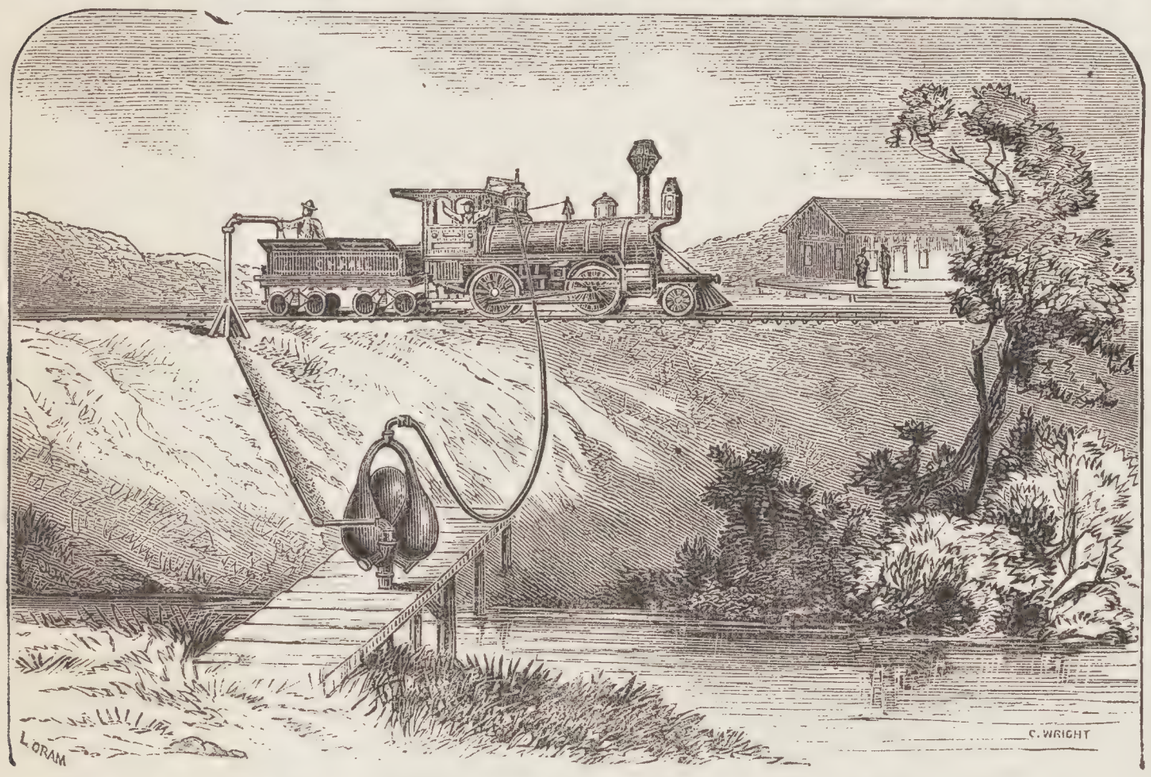

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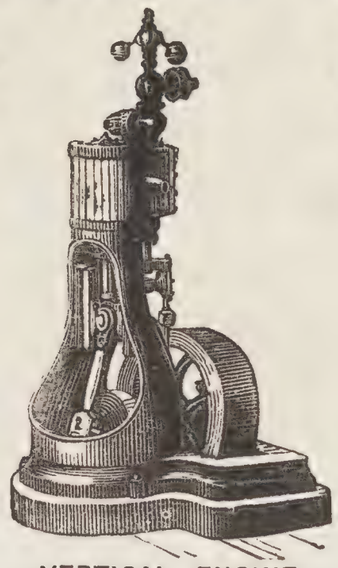

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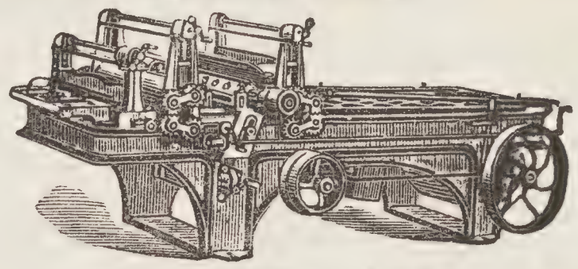

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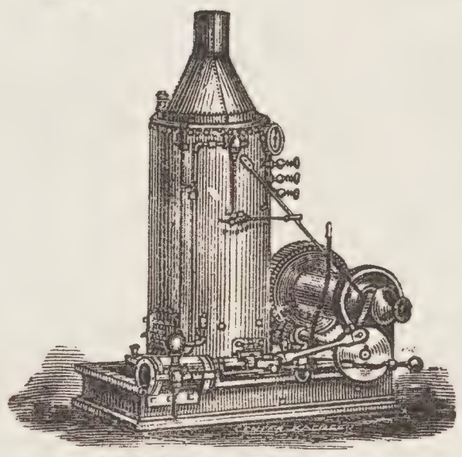

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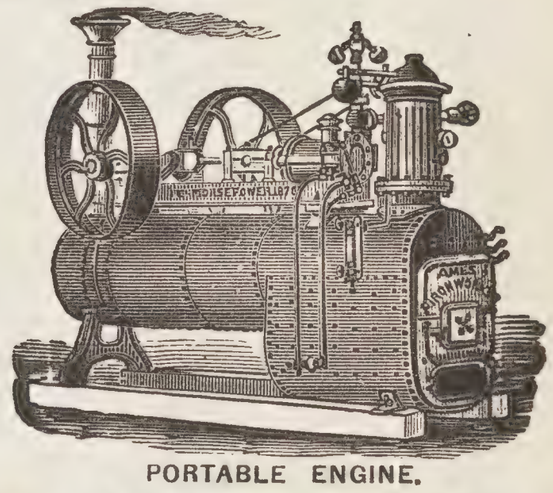

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Interchange of Cars.

A CORRESPONDENT of the *Railroad Gazette*, after pointing out the increasing difficulties and complications attending the interchange of freight-cars, and the need of some well-matured system applicable to all roads, proposes the following plan based upon the clearing-house principle. He says,

"The only means by which all these difficulties can be overcome is the establishment of a clearing-house. Each road would send to the clearing-house reports from each station of cars loaded outward for places off the roads, and one of cars received from places off the roads; from junctions there would be reports of cars received and cars delivered. At the clearing-house, each road would have a record book, showing the performance and earnings of its cars off the home-road, but not noticing them while on the road. Another record should show the amount debited each road for the use of foreign cars. Claims for exemption would be allowed or disallowed by the secretary or manager of the clearing-house, from whose decision there would be appeal to a committee. All settlements would be made directly with the clearing-house, which would debit and take credit for cars in each instance as if it were the owner. And here is the power to enforce its decrees; no road could say, 'We will not pay,' for the clearing-house simply debits it, and holds the money due to it from other roads. If the monthly balance be against a road, and it refuses to pay, it would be expelled, and all the clearing-house roads would refuse to interchange with it. It does not follow that all roads belonging to the clearing-house must adopt the same rate: for instance, some roads may agree to pay a per diem demurrage, others may object to such an arrangement. Then those in favor of demurrage can adopt that system in their interchange with one another, and can either refuse to interchange with other roads, or do soon their terms of simple mileage.

"Returns would be sent to the clearing-house daily from junctions by the companies' agents, and at important termini there would be independent number-takers appointed by the clearing-house.

"RULES TO GOVERN THE INTERCHANGE OF FREIGHT-CARS.

"Definitions of the terms used in these rules:

"SHIPPER: The merchant or other person delivering the goods for shipment.

"CONSIGNEE: The merchant or other person to whom the goods are to be delivered at destination.

"OWNER: The railroad company owning or leasing the car.

"POSSESSOR: The railroad company on whose road the car is at the time referred to.

"DELIVERER: The railroad company delivering the car to another railroad company at any junction.

"RECEIVER: The railroad company to whom the car is delivered.

"INTERMEDIATE ROADS: Any road which lies between the loader and unloader.

"HOME-ROAD: The road of the owner of the car.

"HOME-JOURNEY: The journey back to the home-road from the point to which the car was loaded.

"OUTWARD JOURNEY: The journey away from the home-road.

"FOREIGN CAR: A car which does not belong to the road on which it is at the time referred to.

"FOREIGN ROAD: Any road other than the 'home-road.'

"THROUGH-FREIGHT: Freight destined for any point off the road on which it is shipped.

"FOREIGN FREIGHT: Freight which passes over the road, but is not from or to any point on it.

"LOADER: The road on which the car is loaded.

"UNLOADER: The road on which is the destination of the car, that is, the road on which the car is to be unloaded.

"LINE-CAR: A car used in any of the transportation lines, such as 'Blue Line,' 'Red Line,' 'Empire Line,' etc.

RULES.

"1. Railroad companies using foreign cars shall pay to the owners remuneration for the use thereof as follows:

"*a.* Mileage at the rate of 1½ cents per mile traveled, each way, loaded or empty.

"*b.* Demurrage at the rate of 75 cents per diem for every day the car is detained beyond the allowance of time covered by mileage.

"*c.* The time covered by mileage is:

"At each place of delivery (junction) 1 day, (allowed to deliverer.)

"At destination to unload, 1 day.

"Destination to load for return, 1 day, (if returned empty, these not to be allowed)

"Journey, for every 100 miles or under, 1 day.

"*d. Exemptions from demurrage:*

"When a road is blocked by natural obstructions, demurrage shall not be charged for as many days as the obstruction lasts.

"If a road is, by reason of obstructions, or excess of traffic, unable to receive cars or unwilling to incur the liability to demurrage, it shall notify its connections and the clearing-house, and shall not be held liable for demurrage on cars delivered it more than 24 hours after the notice is given. In such case, the clearing-house shall immediately notify all roads interested that demurrage can not be collected if cars are consigned by that route.

"2. At every junction of railroads operated under different managements, an understanding shall be come to as to the places where cars are to be delivered to each other, and when a car properly labeled is placed at that point which is the acknowledged place of delivery, it is from that time at the risk of the receiver, unless the latter shall have given notice of its inability to take cars forward.

"3. If a car be considered by the receiver unfit to travel, it must be returned to the deliverer, and until such redelivery has been accomplished, the car is at the risk of the company to which it was first delivered.

"4. It is the duty of the deliverer at a junction to put the cars into such condition as will satisfy the receiver, or to tranship the goods. If a car be damaged, yet fit to travel, the receiver shall notify the deliverer, and also the clearing-house, stating accurately the extent of damage, for which it shall then be released from reponsibility.

"5. As soon as a car passes off the home-road, the possessor is responsible for all and every contingency that may arise from the use of such car; except that if the contingency is clearly traceable to a defect of material or workmanship, and in case of failure of wheels or axles, *the ordinary repair of replacement* of such car shall be at the owner's expense.

"6. The cost of repairs arising from ordinary wear and tear, if not less than $5, shall be borne by the owners; but in cases of palpable damage from negligence, such as from dropping heavy weights, smashing of doors, neglect of greasing, etc., and in all cases of collision and accident, the damage shall be made good at the possessor's expense. The possessor may elect either to repair the car or return it to the owner for repairs.

"7. The cost of transporting damaged rolling-stock home must be borne by the company on whose road the damage occurred.

"8. Accounts for repairs done must be rendered to the debtor companies within three months.

"9. Each car should be marked with the maximum weight it can safely carry. If the car be loaded in excess of the marked weight, and accident happen at any point on the journey, the loader shall make good to the possessor all damage done to the car, and the possessor shall settle with the owner.

"10. When a car has been damaged by misuse, such as loading coal-oils in grain-cars, etc., the owner shall have the right of calling upon the company that misused the car to take it and pay the value thereof.

"11. Every car sent off the home-road should be properly labeled, showing the route it is to travel. The home-journey must be by the same route as the outward journey. When a car is missent on the outward journey, the road missending it is responsible to the owner for all demurrage from the time it is missent until it arrives at destination. When it is missent on the home-journey, the road missending it is responsible to the owner for all demurrage from the time it is missent until it arrives home. (*See* § 13; *line-cars.*)

"12. The *destination* of a car is the farthest station to which it was labeled when starting on the journey. If bulk is not broken, the car may be sent on to any other station at mileage rates; but if unloaded and reloaded for another station, forward or otherwise, than as provided in the following section, it shall be considered as missent, and the road missending shall be debited with full demurrage.

"13. Foreign cars must not be used after arrival at

destination for any purpose, except that of carrying a load home, or in the direct line of return home, or to a point beyond the home-road.

"Line-cars when unloaded must be sent to the point where load awaits them, according to the orders of the line-manager.

"14. Each car delivered at a junction must be accompanied by a separate way-bill, showing contents of car, initial point, destination, and route. Demurrage incurred by neglect to deliver the way-bill should be debited to the *deliverer*.

"15. Returned cars may be delivered to the home-road at any of its junctions, unless the latter demand that they be delivered at the starting-points.

"CLEARING-HOUSE.

"*Plan for the formation of a clearing-house for the purpose of keeping records of foreign car traffic, and of adjusting mileage and demurrage accounts between the railroad companies parties thereto.*

"1. *Membership.*—Any railroad company may become a member of the Clearing-House Association by making application addressed to the secretary of the clearing-house, signed by the president or general manager of the company.

"2. *Withdrawal.*—Any railroad company member of the Clearing-House Association may withdraw from it on giving to the secretary notice, signed by its president or general manager.

"3. *Expulsion.*—Notice may be given to any company member of the Clearing-House Association that in one month from the date of such notice it shall cease to be a member, provided that a resolution to that effect be adopted by two thirds of the members present in a general meeting of members.

"4. *Representation.*—Each company party to the clearing-house shall be represented in all meetings by one delegate properly accredited. Companies whose roads are operated by other companies shall not be represented in conference.

"5. *Annual Convention.*—A conference of members shall be held yearly on————, and at such times as the chairman or any two members may appoint.

"6. *President.*—A President of the conference shall be elected by ballot to serve one year; he shall preside at all meetings and shall name all committees.

"7. *Arbitration Committee.*—An arbitration committee of thirteen members shall be appointed yearly, and shall hold quarterly meetings.

"8. *Secretary.*—A secretary shall be elected by the conference to superintend the working of the clearing-house.

"9. *Treasurer.*—A treasurer shall be elected yearly at the annual conference. He shall receive all moneys due from railroad companies on the secretary's draft, and shall pay the amount due to railroad companies on order signed by the secretary; he shall pay amounts necessary to cover the expenses of the clearing-house on order signed by the president and secretary.

"10. *Number-takers.*—At every junction of railroads operated by companies parties to the clearing system, the secretary shall appoint number-takers, who shall perform such duties and make such returns as the secretary shall direct. At junctions where the traffic is so small as not to require a special number-taker, the railroad companies, through their agents, shall prepare such returns as the secretary may require.

"11. *Records and Accounts.*—From the returns rendered by the number-takers, records shall be made by the clearing-house of car movements, and accounts of the amounts due to and from each company, made up according to the rates of each company.

"12. *Accounts and Drafts for Balances.*—All accounts for mileage and demurrage shall be made out as between the clearing-house and the company, and drafts made by the secretary in favor of the treasurer for balances against companies.

"13. *Payment of Balances.*—Payment on account of balances will be made as soon as sufficient money to transfer is paid to the treasurer by debtor companies, each creditor of the clearing-house receiving a ratable share of the whole amount paid.

"14. *Unpaid Balances.*—Interest at the rate of 12 per cent will be charged on balances not paid to clearing-house within one month of date of draft.

"15. *Errors in Balances.*—All balances must be paid as declared by the clearing-house, and any errors in them subsequently adjusted.

"16 *Appeals.*—Appeals from the secretary's assessment of demurrage can be taken to the arbitration committee, and if the amount in dispute be more than $2000, an appeal can be taken from the committee to the conference, whose decision shall be final. In all questions involving $2000 or less, the decision of the committee shall be final.

"17. *Expenses.*—The expenses of the clearing-house shall be assessed on members in proportion to their foreign car-receipts.

"*Rules for Guidance of the Arbitration Committee.*

"1. This committee shall consist of 13 members.

"2. Three members shall form a quorum.

"3. The committee shall meet quarterly at such place as the chairman may appoint.

"4. The committee shall elect from their number a chairman, whose duty it shall be to preside at meetings and to arrange for the attendance of at least three members at every meeting.

"5. The secretary of the clearing-house shall be the secretary of the committee.

"6. The powers of the committee shall extend to the hearing of complaints and determining the liability of parties in respect to damaged rolling-stock, compensation for damage done rolling-stock, claims to exemption from demurrage, and any other claims that company parties to the clearing-house may agree to submit to them for arbitration. They shall have power to send for such witnesses as they may consider necessary, and to have records and papers examined by any persons whom they may depute for that purpose.

"7. The expenses attending each session of the committee shall be borne by the companies against whom judgment is given.

"8. A member of the committee shall not sit as a member to arbitrate on a case in which his company is interested, and if called upon by any interested party, he shall leave the room during the proceedings of that case.

"9. From the arbitration committee an appeal shall lie, in cases involving more than $2000, to the conference.

"10. Members of the arbitration committee shall be officers of railroad companies parties to the Clearing-House Association, and must be of rank not lower than general freight-agent or master-mechanic."

Cost of Railroad Transportation.

AT the late annual convention of the American Society of Civil Engineers, held in Louisville, the following remarks were made by Mr. William P. Shinn, formerly general freight-agent of the Pittsburg, Fort Wayne, and Chicago Railway. Referring to a statement made by Mr. McAlpine, who had preceded him in the discussion, to the effect that railroads had received the attention of the best engineering minds of the country, Mr. Shinn said:

I beg leave to differ with the gentleman upon that point. Not in the broad sense that railroad companies have not had in some capacity the assistance of the best engineering minds of the country, but that the question of the transportation management of railroads has not received the attention of the best engineers. I think that the gentlemen here assembled will admit that. The men that are prominent in managing our principal lines of railway are not noted for being celebrated engineers, but they are rather noted for being successful manipulators of legislatures, successful operators on Wall street, successful men in getting up corners in stock—in increasing and depreciating *nominal* values. That is the class of men with whose names our newspapers are filled as the men who control railroads, and who control them, not by virtue of their talents as practical managers, but through their ownership of stock, or by the confidence of those who do own stock. Now, so far as I have been able to observe in my short experience, there is no class of men in this country who are less liable to become either manipulators of legislatures or victims of credit mobilier schemes, than the gentlemen of our profession. We do not find prominent engineers getting up schemes of that kind, either to run railroads or to build them. On the other hand, we do not find men who have control of the railroads, and who are operating them, investigating the scientific basis upon which the economy of transportation depends. Nor, I am sorry to say, do we find them employing others to do so. As a consequence, the wildest notions prevail on the subject of economy of transportation. It is asserted by gentlemen who have investigated the subject somewhat, that it costs one and one-half cents per ton per mile to transport freight by rail. I am prepared to say that the prominent railroads of this country transported freight by rail for seven ninths of a cent per ton per mile last year, and made money on the traffic. Therefore, the cost of it must have been less than that, but I have fixed that rate as having some relation to and being above the actual cost. The rate from Chicago to New-York for the transportation of fourth-class freight in 1872 was about forty cents per hundred pounds. There was five cents per hundred pounds expense at New-York in getting it across the river and delivering it to vessels in the harbor, leaving thirty-five cents per hundred pounds, or seven dollars per ton, for the rail transportation over 900 to 960 miles of railway. The road that transported freight at these rates never made more money than they did last year—ergo, they didn't do that business at a loss, as it formed a large proportion of their traffic.

From this the maximum cost may readily be deduced, and it is evident that the maximum cost was seven mills per ton per mile. That, of course, was upon freight which was moved in full trains of full cars, and under circumstances most favorable to the present railway management.

Now, as I have stated before, instead of the economy of railway transportation having received the attention of the best engineering talent in the country, it seems to me that such talent has been studiously avoided and rigorously excluded from any prominent voice in that management. Roads within my own knowledge have run for years with an equipment which was not more than two thirds adequate to do the business which was pressing upon them. They had a machine in their railway which was capable of doing twice or three times the business that they were doing, but they had not equipment enough to employ it more than one third or one half of the time. After repeated representations of that fact to the managers—an unusual pressure of business having proved to them that there was a demand for more equipment—they made a sudden increase of equipment without making any corresponding increase in side-tracks or terminal facilities, and then they found that they had got the machine disproportioned the other way. They had nearly—perhaps quite—enough equipment for the time, but they had not enough terminal facilities to get rid of the traffic as fast as it accumulated, as they had not side-tracks enough to pass the trains; and they delayed the trains in passing, and so crippled the business of the road by blockading the terminus that, when they should have handled four hundred cars per day, not more than a hundred cars could get through. That is the kind of engineering talent that has been applied to some of our best railroads. I confess it has not been very encouraging.

In regard to the capacity of railroads to do business as compared with canals, I wish to say that the capacity of the former must not be judged at all by the amount of business that has been done upon the four existing trunk-lines of railway. These lines are none of them, so far as I am aware, managed upon a scien-

tific basis. They are not generally controlled by men who value engineers, or who employ them to do any thing more than merely to locate and perhaps construct some of the works. On the other hand, they have been slow to develop the resources of the country; they have been slow to acquire the necessary equipment; they have been slow to give the necessary terminal facilities, and they have all had inadequate facilities at tide-water to get rid of what freight they could bring there.

For instance, the Pennsylvania Railroad, which has the reputation of being one of the best managed railroads in the country, has never been able to get rid of more than sixty cars per day of grain in bulk without being blocked up. They, of course, do not begin to limit the number of cars until they are really blocked up, and then the blockade is transferred from Jersey City to Philadelphia and Philadelphia to Pittsburg, and so on back, until every yard they have from Jersey City to Chicago is full. The necessity for increased facilities was very evident, but the stockholders of the Camden and Amboy Railroad, over which the freight came to Jersey City, took the ground that they could not afford to spend four million dollars at Jersey City to increase the facilities of getting rid of freight for the Pennsylvania Railroad, when they only got ninety miles' haul on it. While it might be of very great advantage to the Pennsylvania Railroad to have four million dollars spent in increasing depot facilities, in filling up docks and building elevators, it manifestly would make no return to them, and therefore they would not make it. All of which will in due time be remedied.

It is undoubtedly true that there is a vast amount of agricultural products that is not carried to the seaboard, but I suppose there is no doubt that a very much larger amount could be brought on existing roads if prices obtainable for it at the seaboard would justify its shipment.

The question as to whether the price can be reduced is mainly a question whether transportation can be done for less than it has been done. I have stated that transportation has been done during the last year at a cost of from seven ninths to seven tenths cent per ton per mile—at a cost to the consumer, not the railroad company. I have reason to believe that that cost can be considerably reduced. Take, for instance, the item of dead weight. A common country wagon, well built, weighing about eight hundred pounds, will carry three thousand, and can be hauled over any fair country road, on which it will have occasion to pass over stones, and receive at places a perpendicular fall of from one to two inches. Then we have the ratio of paying weight to dead weight of about three and three quarters to one. The ordinary box-car in use upon our railway at the present time weighs about ten tons, and the maximum load allowed is usually eleven tons, but the average load that they succeed in getting into it is about eight tons, showing that the dead weight is about fifty-eight per cent of the whole weight.

Now, it does not seem reasonable that a machine constructed to run upon a smooth, even surface, such as a railroad track ought to be, which ought to receive no perpendicular fall, should require a carriage so disproportionately weighty to the load which it carries.

I have already shown that the best engineering talent has not been brought to bear upon the subject of the proper relation of the different parts of railway machinery to each other. Now, as to what amount of tonnage may be carried over a railroad, it is to a great extent a matter of speculation; but if, as the gentleman has stated in the paper read, a railroad was built exclusively to carry freight with a double track, so that the trains could always move upon one track in one direction, and not be required to turn out for any thing, it is manifest that a good many trains could be run in one way upon one track, and the other way upon the other track. The ordinary rule is for freights to follow each other at the distance of five minutes; but by the introduction of the English block system, or something similar to that, it is only necessary that there should be an interval of two minutes. But if we allow ten minutes as the period to elapse between the trains following each other, and have cars of such construction and engines of such power that a train should carry 200 tons, (which is not an unreasonable supposition, for we do that on many railroads now,) we would have 200 tons of freight passing in one direction every ten minutes, or 1200 tons in an hour. Call that a thousand tons. That would be 24,000 tons a day, and 7,200,000 tons in a year, which would be considerably more than my friend McAlpine stated was carried by the whole of the four trunk lines now existing between the East and the West.

Mr. McALPINE.—It is one fourth that was carried by the four railroads.

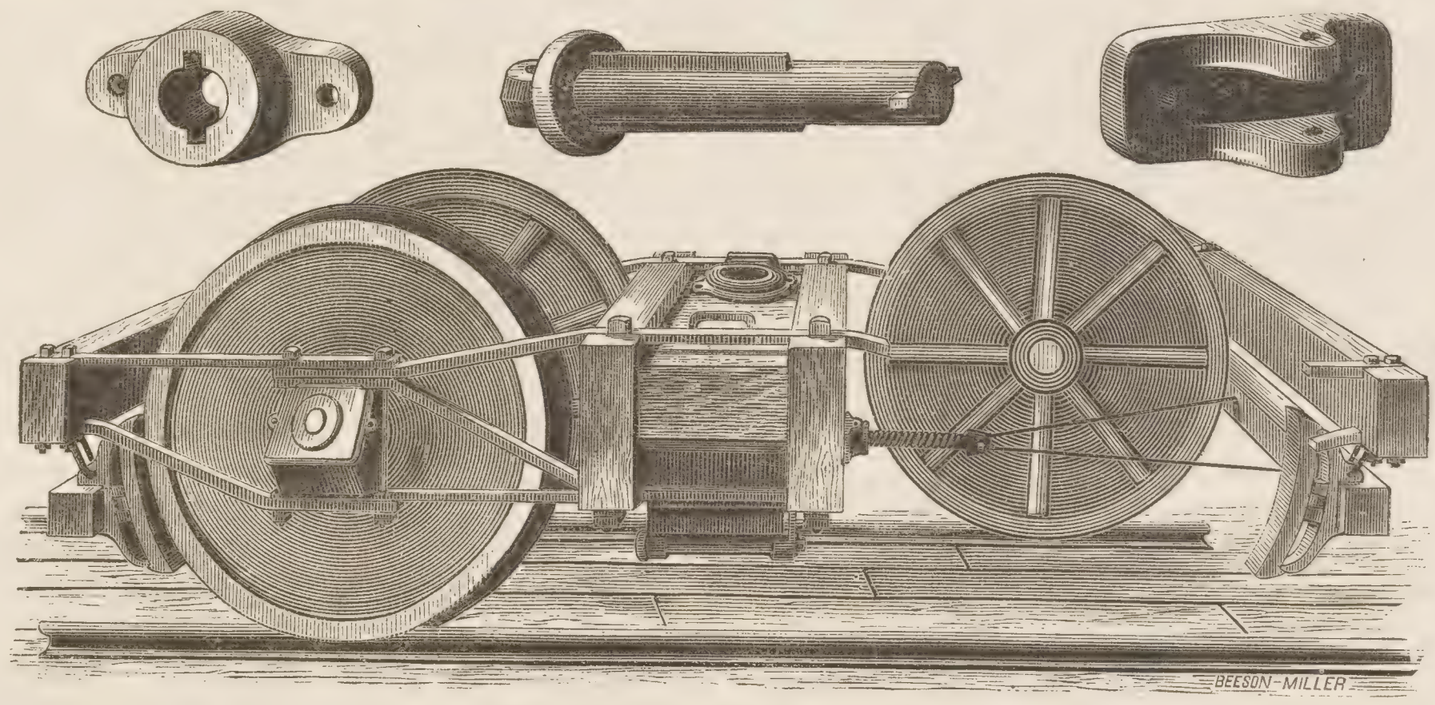
Mr. SHINN.—In an engineering point of view, there is nothing improbable in that. If, as is supposed in the views of Mr. McAlpine which he has submitted to us, there is a vast amount of tonnage now to be transported, there is no engineering obstacle in the way of its being done to this extent. I will not attempt to work out the problem of what the cost would be of carrying seven millions of tons on one railway as compared with the cost of carrying two millions of tons on five railroads. It must be evident that the cost would be very considerably reduced, and as I have already shown that the cost on some at least, if not all of these four first-class railroads, is less than 7-10 cent per ton per mile, it must be evident that the cost would be very low as compared with any figures heretofore stated.

I have thought for some time that it would be very valuable if an investigation could be made by intelligent parties capable of conducting such an investigation from established data, and to give to the country something which would be authority upon the subject of the cost of transportation. There is nothing of the kind now. There is no practical authority upon the subject, nor do I know of any course whence any such authoritative statement may be looked for. It has entered my mind, since the society commenced this session, that it would be a very good thing if the subject could be investigated by a committee.

FIFTY-FIVE railroad companies in the United States are reported as in default for non-payment of interest on their bonds. The total amount of these bonds is $217,959,311, or about thirteen per cent of the whole amount of the railroad bonds now outstanding. With but few exceptions, the cause of the delinquency is due to the tightness of the money market and not to any inherent defect in the roads or their management, and the difficulty, therefore, will be only temporary.

Improved Car-Brake Release.

THE engraving represents an improved device for releasing car-brakes, invented by Mr. George W. Morris, of Pittsburg, Pa. By means of this method, the brake-shoes can be set at an equal distance from the wheels, and can also be instantaneously released when the power for applying them is withdrawn. The cuts show the nature and application of the device, which consists of two connecting-rods attached to the brake-beam, one near each end, and from thence converge to a central guide-rod which is fastened to the centre of the truck transom. On the end of the guide-rod is a press-piece or collar, the form of which is shown in the left-hand corner of the engraving, and to which the connecting-rods are attached. When the brake is applied, the connecting-rods are forced by the brake-beam against the collar, which compresses a steel tempered spiral spring placed around the guide-rod, as shown. The spring, from its central position, releases the brake-shoes simultaneously from each wheel as soon as the power ceases to act upon them. The form of the guide-rod is shown detached in the engraving, and has two ribs corresponding with the length of the spring, also two stops or lugs at the end set at right angles with the ribs. The spring is placed upon the guide, where it is held by the collar or press-piece, the guide-ribs fitting into slots in the collar as shown, and the collar being held by the stops and an intervening wire washer. By this means, the collar is securely locked, and being guided by the ribs, it has no swiveling motion. In the upper right-hand corner of the cut, is the form of the casting by which the guide-rod is attached to the transom, the rod being secured to the casting by a vertical bolt, and is thus accommodated to the lateral swing of the brake-beam and to the irregularities of the track. The connecting-rods, by means of threads and nuts, can be regulated so as to set the brake-shoes any desired distance from the wheels.



Improved Car-Brake Release.

There are other minor points which can be better understood by inspection. The device secures instant release, uniform distance of shoes from wheels, prevents dragging, friction, and unnecessary wear and tear. It is simple, weighs less and costs less than any similar device now in use, and can be easily adjusted to either new or old cars. The invention was patented May 6th, 1873. Samples will be supplied on application to the manufacturers, Keystone Spiral Spring Works, Lock Box 494, Pittsburg, Pa.

FOURTEEN miles of steel rails were laid during the year ending September 30th, on the Boston and Providence Railroad, making upward of forty miles in all, and the directors are so well satisfied of the economy, notwithstanding the great increase of the cost of steel over iron, that they propose to continue its use until the entire road shall be furnished with it, which will be accomplished at no distant day.

THE Chicago, Milwaukee, and St. Paul Railway are putting down steel rails on an extensive scale. On the Chicago division of eighty-five miles, sixty-two miles are laid with steel; and on the La Crosse division, sixty-eight miles, thus placing the line in excellent condition for traffic and travel.

THE first trip by cars of the Canada Southern Railroad across the International Bridge at Buffalo, was made December 1st. There is now direct connection, without change of cars, between Detroit and all points east and south touched by the Buffalo, New-York, and Pennsylvania Railroad.

The Transportation Problem and New Trunk-Lines.

BY JAMES M. BLANCHARD.

THE fact that the facilities at present afforded for the prompt removal of the agricultural products of the country from the points where they are grown or made, to the points where they are consumed, or to the shipping ports on the Atlantic Coast, are inadequate, is evidenced by the action of the managers of the New-York Central, Erie, Pennsylvania, and other trunk-lines of road, and by the further fact that a committee of United States Senators are now investigating the question, and are called upon to recommend the enlargement of the facilities at present afforded by the canals, which derive their business mainly from this source.

It is a fact which will hardly be disputed, that the increase in our agricultural products has been such as to tax to their utmost capacity existing lines of transportation during certain portions of the year, and hence the desire for greater facilities. This increase of production has resulted from various causes—a more extended area, better cultivation, larger demand, and improved facilities for reaching a market. Large as it has been during the past twenty years, it will be greatly exceeded within the next twenty, because of the rapidly increasing population of our Western States and Territories, each one of which will become producers of a surplus of such products.

If then the present means of transportation are inadequate, the question may well be asked, What is to be done with the crop of 1883, ten years hence? The obvious answer to this question would seem to be, the construction of new trunk-lines of railway connecting our seaport cities with the agricultural fields of the West, such lines terminating at such points as the development of the country and the convenience of shippers may require. Would such a line of road be a paying investment? It is believed that it would, and that if commenced at once and prosecuted with vigor, the business would be waiting for it when completed. I venture to assert, and shall attempt to show, that the natural increase of business within the States which would be fairly tributary to such road, is such as to justify the construction of a trunk-line every twenty years, which line, if honestly managed and supplied with suitable rolling-stock, would pay a reasonable interest on its cost. In order to demonstrate the correctness of this conclusion, I append the following statement of leading products for the years ending June 30, 1850 and 1870 respectively, in the States of New-York, New-Jersey, Pennsylvania, Kentucky, Ohio, Michigan, Indiana, Illinois, Iowa, Wisconsin, Minnesota, Missouri Utah, and Oregon.

	June 30, 1850.		*June* 30, 1870.	
Wheat	76,342,434	bushels.	237,018,311	bushels.
Corn	275,364,047	"	527,518,486	"
Oats	149,424,510	"	227,942,754	"
Rye	11,463,556	"	14,110,841	"
Barley	4,686,794	"	18,765,307	"
Peas and Beans	1,354,930	"	2,457,641	"
Tobacco	85,960,472	lbs.	157,851,283	lbs.
Butter	219,877,742	"	397,480,412	"
Cheese	77,441,635	"	38,120,943	"
Wool	32,038,172	"	72,064,010	"
Hay	9,103,531	tons.	21,171,709	tons.
Beef Cattle	4,275,005	head.	6,242,227	head.
Swine	13,734,485	"	14,542,135	"
Sheep	12,023,861	"	17,443,135	"

These figures, which are approximately correct, show an increase of production during the twenty years' interval between 1850 and 1870, as follows:

Wheat	160,675,877 bush.	Butter	177,592,670 lbs.
Corn	252,144,439 "	Cheese,(dec.)	39,320,701 "
Oats	78,518,244 "	Wool	40,025,838 "
Rye	2,647,285 "	Hay	12,068,178 tons.
Barley	14,076,513 "	Swine	807,650 head.
Peas & Beans	1,102,711 "	Beef Cattle	1,967,222 "
Tobacco	71,890,811 lbs.	Sheep	5,419,259 "

With these figures before us, who can doubt that the increase of productions which would naturally find an outlet by rail transportation, would justify the building of at least one new line every twenty years, if indeed it would not one in each decade? especially when we take into the account the fact that the increase of business has been shown upon only a few of the articles which go to make up the business of rail transportation, and that only in one direction; for it should be observed that the increase of business, of which I have been speaking, has no reference to return freight, which would probably increase in about a corresponding ratio.

It is believed that the above facts and figures show the position taken by the writer to be correct, and yet it is not claimed that such lines of road would be paying investments as such roads are at present constructed, but more especially as they are at present equipped, and it may fairly be regarded as doubtful whether such would be the case; but if they were properly and economically built, and were furnished with the best possible rolling-stock that the experience of the age can suggest, all doubts as to the remunerativeness of the undertaking would at once vanish, and the question of pay would be as certain as that of business. That the construction of the rolling-stock of railroads is capable of being so modified as to make the difference between the cost of the road and the rolling-stock a paying or non-paying investment, is capable of demonstration; but so long as the difference between the weight of the paying freight and that of the non-paying is no greater than at present, no stock-holder has a right to expect that any price to which the public will long submit will enable him to realize a reasonable percentage upon his stock. Our cars, as at present constructed, are made principally of wood and iron, and without reference to the superiority of these materials over others which could be selected—the qualities of which are well known—and the consequence is an undue weight, in order that an amount of strength just sufficient to enable them to carry their loads may be obtained. That this manner of constructing cars is very unscientific, needs only to be asserted, it does not require proof, it being a fact that the material used is not selected because that particular kind will resist the greatest amount of strain in the particular place where it happens to be placed, in proportion to its weight, but because it is the most convenient, and because its use is common. Another practice which is very common upon existing lines of railroads, and which prevents many an honestly earned dollar from finding its way to the stock-holders, is that of having upon one line a variety of styles of cars and engines, thus necessitating the keeping on hand a great variety of fitted work, so that when a part fails it may be at once supplied, and the cars or engines again put into service. The remedy for this last difficulty is not an easy one to apply to existing lines, as upon them it must of course be a matter of time; but in equipping a new line it certainly is easy of avoidance, as it is only necessary to employ the requisite talent in order that the best possible form of rolling-stock may be placed upon the line at the start, and then there will be no necessity for changes afterward, which will entail continual expenses. Suppose, for instance, that an engineer determines upon the best form of an axle for cars, it is clear that such axle is equally adapted for use under passenger and freight-cars; and so with an oil-box, and with most other parts of the running gear of cars. Now if these parts were made interchangeable, it follows that a vast amount of money would be saved to the company using them.

The remarks above made in reference to cars, are to a great extent applicable to locomotives, which should be in most respects alike, the exceptions being in the diameters of the wheels and in the valves, and the manner of adjusting them; the other parts, or at least those which are capable of being interchanged, should always be made with reference thereto, in order that when one engine is undergoing repairs, and a part of one in use fails, its place may be supplied from the idle one, and thus one of the two kept in service. The question of a proper rate of speed for freight-trains is so intimately connected with their proper construction that it is impossible to treat either intelligently without at least referring to the other; and it is held by the writer that a proper determination of these two questions will prove to be a full solution of the question of rates to be charged for carrying freight, as no one will contend that for a given sum of money, a given quantity or number of pounds of freight can be carried one hundred or any other number of miles in heavy cars, and at a rate of speed equal to twenty miles an hour, as cheaply as it can be carried the same distance in lighter cars, and at a rate of speed equal only to eight miles an hour; and it should not be forgotten that at either of the rates of speed named, or at any other, the injury done to the cars and to the track upon which they run will be in exact proportion to their weight, as well as to the speed at which they are drawn.

The statements here made seem to the writer to be perfectly logical, and if they are, then it will follow that with a slight concession on the part of shippers on the one hand, and of railroad companies on the other, the question that is now agitating the country can be amicably adjusted and the interest of both fully protected. The concession required of shippers is, that they consent to a lower rate of speed; and that required of railroad companies, that they furnish their lines with lighter cars, and with engines better adapted for moving freight. If this compromise was effected, there can be no doubt that the price of transportation could be so reduced as to be perfectly satisfactory to farmers and shippers, and at the same time the net earnings of railroad companies would be increased, and thus the greatest possible inducements furnished for the construction of the new lines, and their success as an investment assured.

Permit me here to introduce a supposition, as it may serve to more fully demonstrate the relation between weight and speed. Take any one of our existing lines of roads, the iron of which will weigh say 60 pounds to the yard, and place upon it engines weighing 15 tons, and freight-cars, each weighing 12,000 pounds, and let them be run at a speed of 8 miles an hour. With such a condition of things, how long ought the iron to last? Again, suppose that upon the same line, or another parallel with it, the rails were made to weigh 75 pounds to the yard, and the engines 30 tons each, while the cars were made *so strong* as to require the weight to be 20,000 pounds, the whole to be run at 20 miles an hour, the net number of pounds of freight carried in each case being the same. How long ought the iron to last, and what would be the endurance of the cars and engines in both cases? It is clear that there should be a percentage in favor of the latter in order to make the company's ledger balance, because it would be found that the iron had cost more because it was heavier, and the cars and engines for the same reason. Would not this be the result? Would not the percentage, in fact, be in favor of the first proposed plan? I shall not attempt an answer to these questions, but leave them as they are, in hopes that some of the writers upon these subjects, or some of the advocates of heavy rolling-stock, will give us the figures in reference to them, as they are capable of a tolerably correct demonstration by such means, but of a much more satisfactory one in practice.

The Pennsylvania Railroad Shops, at Altoona.

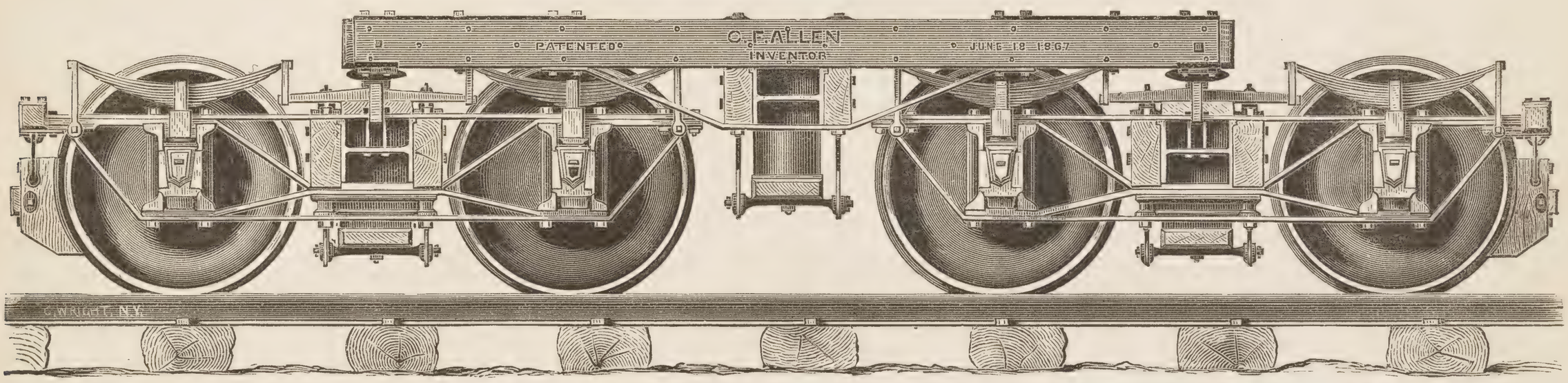
THE car-works of this company were originally located at Harrisburg, but were removed to Altoona in 1851. The town at that time contained but 6 or 8 houses, and the number of men employed was about 35 or 40, all told. Now there are 3000 men engaged, although the force of workmen in all departments has been materially reduced since the panic. The various shops which constitute the car-works proper, are situated in the eastern part of the city, along the line of the road, a half-mile from the depot, and cover what was previously a large farm. The average capacity of the works is from 75 to 80 cars a week. In 1872, 11,246 cars passed through the shops. In August, 1872, there were made and repaired 846 cars; in August,

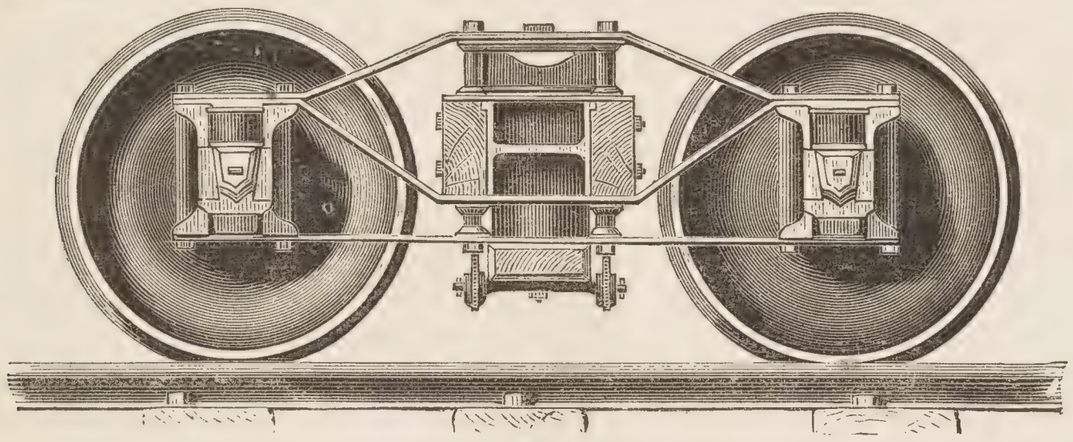
1873, 1559 cars. The total number made and repaired for the first nine months of 1873 were, freight, 10,538; passenger and emigrant-cars, 488; total, 11,026. The passenger-shop is 70 feet wide by 350 feet long. The freight-shop is a round-house, 450 feet in diameter, with a turn-table in the centre, from which radiate forty tracks, each being under the charge of a track foreman. In the sheds for storing lumber are about 14,000,000 feet, with 13,000,000 more ordered and now arriving. The kiln for drying has a capacity for turning out 35,000 feet of boards every 48 hours, ready for use. Each piece of lumber is prepared in the planing-mill, ready for fitting, and is given out only on order from a foreman, who is subject to the general foreman of the works, J. P. Levan, Esq. The supply department of the company, from Jersey City to Pittsburg, is located here.

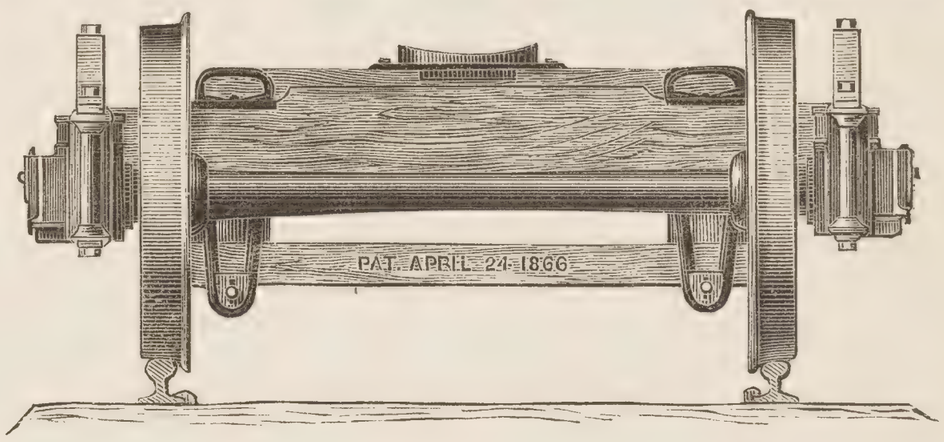
The store-room, in which are kept the trimmings and car-supplies for passenger and freight-cars, is a two-story building. The first floor is only occupied partly by the store. The general foreman's office and time-keeper's office both occupy part of this story, but the second story is used entirely for supplies. The building is 80 x 40 feet, giving a store-room of about 130 x 40 feet, with shelving and tables, cupboards, etc., to contain goods. Here they have a store-keeper, three clerks, and a laboring man, who are more or less constantly employed. This building is entirely too small, and at no distant day will be enlarged. In the passenger-shop, the cars are made ready for the inside work with the exception of painting. The cars then are run into the paint-shop, a building 400 feet long by about 75 feet wide. In this shop, the cars are painted and varnished, and still farther prepared for the inside wood-work, etc. On the second floor of this building are the varnish and upholstery rooms. In the former, all the seats, doors, etc., are varnished ready for upholsterers and cabinet-makers to place in position. In the latter, all the cushions and head-linings are prepared. The cabinet-shop is a building 300 x 75 feet. Here all the inside wood-work for the cars is got out, by cabinet-makers and carvers. These men put all the inside work in the cars, such as seats, baggage-racks, locks, windows, etc. Many pieces of elegant workmanship are made in this shop, and thousands of feet of veneering are used annually.

Next is the machine-shop. Here are fitted up all the wheels and axles for both passenger and freight-cars. Also, the drilling, screen-cutting on bolts and nuts. This building is 75 x 125 feet. The blacksmith-shop comes next, in which large steam-hammers and steam-blowers are used. Here, all the iron-work is got ready for the cars, both passenger and freight, with exception of being drilled, etc., and that is done in the machine-shop. This building is 75 x 300 feet. The planing-mill is a building about 75 x 200 feet, where all the material is worked ready to be put together. The machinery is all driven by a powerful engine of 175 horse-power. The shops are all heated by steam, the pipes extending hundreds of feet through the different shops. There is also a fire-proof building, in which are stored all the paints, oils, etc.

The company have also, for their own protection as well as for the Mountain City, a second-class Amoskeag fire-engine. This is managed by a set of men working for the company, who are regularly organized and have control of the engine, but are subject to the orders of the company. They parade about 125 men. There are four different entrances to the shop-yard; at each entrance is found a watchman, who, upon your entrance, will tell you to proceed to the general foreman's office and get a pass, providing you are visiting, which will take you through the shops and out at the gate without trouble. The watchman at the gate lets you pass, the rule having been adopted on account of frequent infringing on the rights of the company.—*Railway Register.*







Allen's Centre-Bearing Swing-Beam Trucks.

THE engravings illustrate an eight and four-wheel car-truck, invented by Mr. C. F. Allen, the present general manager of the Pullman Car Company's works, at Detroit, and formerly the master car-builder of the Chicago, Burlington, and Quincy Railroad. The general principle of their construction is well known to railroad men, especially in its application to freight-cars; and the engravings represent the details so fully that little description is necessary.

The truck, as its name implies, is centre-bearing and swing-beam, with such an improved construction as to provide for the essentials of strength, simplicity, durability, and economy. The principal parts of the frame are of iron, firmly secured and braced; the swing-beam, transoms, and spring-plank only being of wood, also the bridge or platform of the eight-wheeled truck, as shown in the cut. Two independent four-wheel trucks are combined in the formation of the eight-wheel truck, the two being connected by a platform or bridge as shown, and the end of the coach-body supported by the platform transoms. The two ends of the bridge are supported by the two trucks respectively. The swing-beams of each have a lateral movement, and the hanger-links are provided with cast-iron bearing-blocks at their top and bottom; the upper blocks being pivoted upon metal plates on the transoms to sustain the wear and tear of oscillation, and the lower ones holding the cross shafts upon which the spring-plank, swing-beam, and intervening springs rest. Between the ends of the transoms are metal boxes, or H castings, secured firmly to the timbers by horizontal bolts.

It is claimed for these trucks that they take curves naturally and easily, do not press out or endanger the rails, the flanges of the wheels are saved, and skidding prevented; that they have an elasticity of action which enables the motive power to start with greater ease and with a larger number of cars, and that trains equipped with them are less liable to stall upon the track. While avoiding the rigidity and concentrated weight upon the rails of the six-wheel truck, it has the same ease in curving, affords more space for adjusting the parts, and also admits of journal springs. It is also said, upon the testimony of engineers and others, that by the use of these trucks the efficiency of the motive power is increased twenty or twenty-five per cent. They have been tested on the above-named road with which Mr. Allen was connected at the time his invention was made, and were adopted by the company as their standard freight-car trucks. The eight-wheel truck was also applied to the first Pullman palace-cars built at Aurora, Ill.

A six-wheel iron truck has also been invented by Mr. Allen, which we hope to be able to illustrate and describe in our next issue. These trucks—the four, eight, and six-wheel—are covered by patents dated respectively April 24th, 1866, June 18th, 1867, and May 12th, 1868. Further information may be obtained by addressing A. I. Ambler, P. O. Box 1644, New-York City, who has for several years been identified with these trucks, and has aided in their introduction upon Western roads where they are now extensively used.

PERHAPS the item in which method brings the largest returns is that of keeping machinery in constant use. Not only by this means is its usual profit obtained, and the interest on its first cost saved, but the mechanism, if kept in good repair, will last much longer; for it is well known that when in daily operation, a machine, like an engine-lathe, will deteriorate but one half as fast as when entirely idle. This should be kept in mind when selecting for manufacture a line of staple articles; that which will keep the machinery running regular throughout the year, other things being equal, pays a better interest on time, money, and labor than that which for any cause must be allowed to stand idle at intervals.

DURING the year 1872, there were 18,243 applications for patents made to the United States Patent-Office.

The Chicago, Rock Island, and Pacific Railroad Shops, at Englewood.

THIS company have recently made some important additions to their shops at Englewood, a suburb of Chicago. These additions include an iron and brass foundry, store-house, oil-house, gas-works, etc. We give, as a matter of interest to our readers, some account of the plan and interior arrangement of these structures.

The iron foundry is completed and in operation, except that portion of it intended for casting wheels. It is a substantial brick building, 190 x 60 feet, with a track running lengthwise through the centre. Five large cranes are placed in positions for doing the heavy lifting of all kinds. There are eleven wheel-pits located on one side of the main building, a 42-inch cupola, a crane for handling the wheels, also two steam-elevators for supplying the cupola. This leaves the main room free for the work of the foundry. The blast is produced by a rotary fan-blower made by P. H. & F. M. Roots, of Connersville, Pa. The power for driving the machinery is supplied from the machine-shop by means of a wire cable. In this foundry will be made all the iron castings required for cars, bridges, track, locomotives, etc. Adjoining this building, is the new brass foundry, of sufficient capacity for supplying all castings of this kind required by the road. Near by is the pattern-shop, a brick building of two stories, and with an iron and slate roof. The most effectual precautions have been adopted against fire. The patterns are all numbered, and for convenience in storing, are divided into ten sections, each section consisting of a five-story rack accessible on every side. Patterns for locomotives and bridges are stored in this building, those belonging to the car-department being kept elsewhere. The numbers of these patterns are entered consecutively in a book, with the name, dimensions, and special use of each; and if for a locomotive, the number of the engine using it. In another part of the book, the names of the castings are arranged alphabetically, with number, size, and where used. Each shop on the road is provided with a duplicate of this record, so that any article can be ordered by its number instead of its name. The numbers already entered exceed two thousand.

At a convenient distance from the foundries is the store-house for castings, which is also a brick building. A clerk is in charge who delivers nothing except on the requisition of the foremen of shops. These requisitions are entered in a book kept for the purpose, in which is also entered the name of the account to be charged therewith. The castings are arranged in piles, each pile having its appropriate number. No one is permitted to order any thing to be made at the foundry except the clerk in charge of the store-room, and by this system an undue accumulation of castings is avoided. The different brass castings used on all the locomotives of the road, and requiring renewal, are only 88 in number, the master-mechanic, Mr. Twombly, having, by long and persistent endeavor, brought the various classes of engines to a point as near to uniformity as is possible. These 88 castings have been drawn full size, and pasted on a large bulletin board, (varnished to protect the drawings,) which is suspended in the office of the brass foundry. A duplicate is hung in the office of the store-room, and in each locomotive shop on the road, so that a glance at it shows a picture of the piece required, with its corresponding number.

The main store-house, also erected recently, is built of brick, and is about 40 x 200 feet. Iron and steel bars are arranged against the walls and in racks, the other parts of the room being used for nails, spikes, and the thousand and one articles needed in keeping up a railroad. Chains, rope, bell-cord, and hemp and soapstone packing are wound on reels, so that pieces of any length can be cut off without disarranging the stock. Cans containing whiting, glue, shellac, etc., are placed at one end of the room, and a scale for weighing whatever goes out stands conveniently near. A separate room adjoining, contains brass castings, brass couplers, solder, spelter, and articles of like nature. The contents of this room are quite valuable. The admirable system governing the supplies of the road is due to the assistant superintendent and purchaser, Mr. Allen Manvel, who finds time, in addition to his other duties, to give a personal supervision to the shops and store-houses of the company.

The oil-house is of course fire-proof; the oil when received is hoisted to a platform and emptied into the tanks which are placed in a row underneath. These tanks have each a glass tube showing the height of the contents. In winter, a steam-pipe coil beneath keeps the oil at the proper temperature. One bale of waste is brought into the oil-house at a time and opened, and both oil and waste are measured out as taken. Mr. Manvel thinks he could improve on this arrangement by lowering the tanks so that the tops would be on a level with the floor, and using pumps for drawing the oil.

A small room adjoining the engine-house is fitted up for screening and drying the sand used by locomotives. A series of horizontal screens are used with steam heat. Beyond this group of buildings are the company's gas-works, where the gas is made for lighting the round-house and shops. The water for locomotive tanks and other purposes comes from Lake Michigan through a six-inch pipe three miles long, laid by the company. This water is better for boilers than that from artesian wells. We have not space to describe the machine-shop, which is an immense room containing a large quantity of expensive and valuable machinery. It is said to be the model machine-shop of the country.

The Master Car-Builders' Annual Report in England.

A RECENT number of *The Engineer*, (London,) contains copious extracts from the last annual report of the Master Car-Builders' Association, accompanied with extended and favorable comment. Special attention is given to the report of the committee on brakes, a portion of which is copied, including the questions embodied in the committee's circular. The report is regarded as a virtual indorsement of the Westinghouse air-brake, which indorsement coincides with the views of the editor in regard to its merits as demonstrated by its use thus far in England. The table showing the dimensions of axles used on our roads is copied in full, with the axle drawings; also the drawing of the standard axle, with a summary of the reasons for its adoption. The weight of evidence in its favor is considered conclusive. After referring to the experiments made by Mr. Garey to ascertain the comparative wear of bearings upon different-sized journals, the writer says:

"Nothing is said as to the actual weight carried on each axle, but the data are very complete without this information, and show conclusively that the larger axle is the least costly to maintain. We cite this as one example out of many, to show the careful way in which the question has been discussed; and we may add that no doubt whatever exists in our minds that the whole weight of evidence tended in favor of the adoption of a large journal. We believe the association acted wisely in not adopting a larger journal than 7 x 3¾, because it does not appear that this size has ever given any trouble either by heating or breaking, and it would be obviously imprudent to adopt a dimension larger than the evidence proved to be necessary. It will be seen also that in the standard axle the extremely objectionable shoulder at the inner end of the wheel-seat has been abandoned, and in this way a fruitful source of accident has been dispensed with. It may be urged that the tractive resistance of the train will be increased by a large journal, but it is impossible to resist the conclusion that where the axles-boxes and journals are most worn, the resistance reaches its maximum; and we have no doubt it could be proved that the larger journals, in the experiments cited, would really cause less retardation than the small ones in the ratio of the weights of metal lost from the bearings. Even, however, though it should be proved that a large axle caused more frictional resistance than a small one, it does not follow that the large axle should be rejected. In all cases, axle friction must bear a small proportion to the whole resistance of a train, and the cost of maintaining brasses and of lubrication is so high that it might be worth while, in a pecuniary sense, to incur a small additional axle resistance to reduce it; while it must never be forgotten that a single broken axle may cause enormous loss in rolling-stock destroyed and compensation to passengers. Whether it is or is not desirable that an axle of uniform dimensions should be adopted on all the railways of a country, is a point which we shall not attempt to discuss here. It is enough for the moment to know that a highly influential body of railway officials, having an intimate knowledge of the conduct of railway traffic, consider that the introduction and adoption of such an axle is desirable. This fact alone is, we think, worthy of the attention of English engineers; and it may yet be proved that the assimilation of constructive details on our iron roads to standard patterns would be productive of numerous advantages."

The Lake Shore and Tuscarawas Valley Railroad.

A CORRESPONDENT writes to us as follows in regard to the condition and business of this road: Some much-needed improvements are being made by this company, at Black River, the northern terminus of the road, and also on the shore of Lake Erie. A new brick round-house is now receiving its roof, and when completed, will be a very substantial and convenient building. It is supplied with all the modern requisites for cleaning and putting locomotives in order when off duty. The road being a new one and the motive power comparatively new, there is no immediate necessity for extensive machine-shops. A part of the round-house has for the time being been fitted up for this purpose, and provided with such tools as are required for making engine repairs. Mr. Eugene Towner has recently been appointed foreman of the locomotive department, and has charge of the machine-shop and round-house. He is a machinist of experience and acknowledged capacity, and was formerly assistant foreman of the Lake Shore and Michigan Southern machine-shops, at Cleveland. The blacksmith-shop has been enlarged to twice its former dimensions, the necessary forges are being put in, and with the addition of a powerful noiseless blower, more than double the amount of work can be done. Mr. D. G. Ball is the "boss Vulcan," and as long as he directs the "anvil chorus," the dealers in inferior iron will find it difficult to palm off their stock upon the road.

The former round-house is to be converted into a car-shop, which will be equal to the requirements of the road for several years to come, unless the business should prove to be larger than is now anticipated. It will be supplied with the most approved wood-working machinery, the most of which has already been purchased. With these facilities, the company will be able to build their own cars, the traffic of the road being confined mostly to coal. This road was among the first to adopt the standard axle recommended by the Master Car-Builders' Association; but not as it was modified by the committee with respect to the diameter of the wheel-seat. In consequence of the delay in maturing the standard oil-box and bearing, the master car-builder of the road had to rely upon his own resources, and contrived a box with a hinged spring-cap and a centre oscillating brass bearing, doing away with the key-plate altogether. After four months of constant service, this box and brass have given entire satisfaction, costing less for repairs and oil than those for the 3¼ x 5½ inch journals formerly used.

In addition to the above-named improvements, a new brick building has been erected and has been in use for about a month, as store-room, oil-room, and office. The accountant, Mr. M. R. Brooker, is an expert in his line, and can hardly be surpassed by the most experienced ink-slinger in the practical knowledge of railway-

shop accounts. The master-mechanic, Mr. Charles Fellows, has the general supervision of all the departments, and is worthy of unqualified praise for his judicious and economical management. The road has 100 miles of main line completed and in operation since April last. There are now 11 first-class freight-engines, and 4 first-class passenger-engines, all of which were built at the Brooks Locomotive Works, at Dunkirk; also 500 cars of all kinds, owned by the road, and from 400 to 600 foreign cars in constant service on the track. This would seem to be doing very well for a little north-and-south road, the traffic of which is limited, as we have said, mainly to coal.

Street-Car Ventilation.

THE *Railroad Gazette* remarks as follows on ventilation as applied to street-cars:

"The popular mind is not educated or bred up to appreciate its importance. At the rate at which the human race is growing in wisdom and intelligence, it will probably be at least a century or more before it will reach a condition of moral and intellectual development which will enable the mass to distinguish between pure and impure air, and to 'love the one and despise the other.' Recognizing this fact, then, what is the best method to adopt to mitigate the evils of bad ventilation in public places? Obviously the only thing to do is to apply a system of ventilation in such a way as to be independent of the control of the indifferent; and, as their wishes must be respected, to have it so arranged that the apartments will be ventilated so that none of the occupants, excepting those who distinguish the difference between pure and impure air, will be conscious of it. This, of course, will sometimes require considerable ingenuity and skill, but it is, we believe, quite practicable in the majority of cases. It might be done in horse-cars in a very simple way by taking out the glazed sash which covers the ventilators over the doors, and substituting one with Venetian slats inclined upward, as in an ordinary blind. By this means, the current of air would be directed upward and distributed through the car before it came in contact with the passengers. They would thus be unconscious of its admission, and it would be impossible to close the opening entirely as is now the case with the present arrangements. The sash or frame with the slats might be made to turn as the present ones do, or be permanently fixed. In either case, it would be beyond the power of the lovers of carbonic acid and organic odors to exclude entirely the pure, fresh air which is so bountifully provided for our use.

"The Board of Health in New-York has several times attempted to compel the railroad companies to provide better means of ventilation. The plans proposed have, so far as we know, been rather cumbersome and complicated, and of rather doubtful utility. If it could be induced to enforce the very simple plan proposed of substituting open slats for the glass at each end of the car, it would, we believe, be very effective, and would, on account of its cheapness, be adopted by railroad companies without much objection; whereas, if any more expensive plan is proposed, they will interpose every obstacle they can to prevent its use. The side ventilators could remain as they now are, as too much air would be admitted in very cold weather if, instead of being glazed, they were provided with open slats. With the front and rear ventilators open, there would, however, be a constant current of air supplied in front and exhausted at the rear end, which would keep the atmosphere in the car very much purer than it is now, when every crevice is closed up and the car at the same time crowded with passengers."

THE extension of the Mississippi Central Railroad from Jackson, Tenn., to the Ohio River, at Cairo, has been completed, and forms with its connections a continuous north-and-south trunk-line from the Gulf to the lakes, over which freight and passengers can be carried without breaking bulk or changing cars.

Improved Centre-Plate and Body-Bolster.

THE engravings illustrate the centre-plate used on the cars of the Pennsylvania Railroad, together with the contiguous parts of the truck and body-bolster. Fig. 1 is a cross-sectional view through the centre of the truss, body and truck-bolsters, and plates. Fig. 2 is a side-sectional view of the same. The form of the upper and lower plates, with the points of bearing contact, are clearly represented, and the advantages

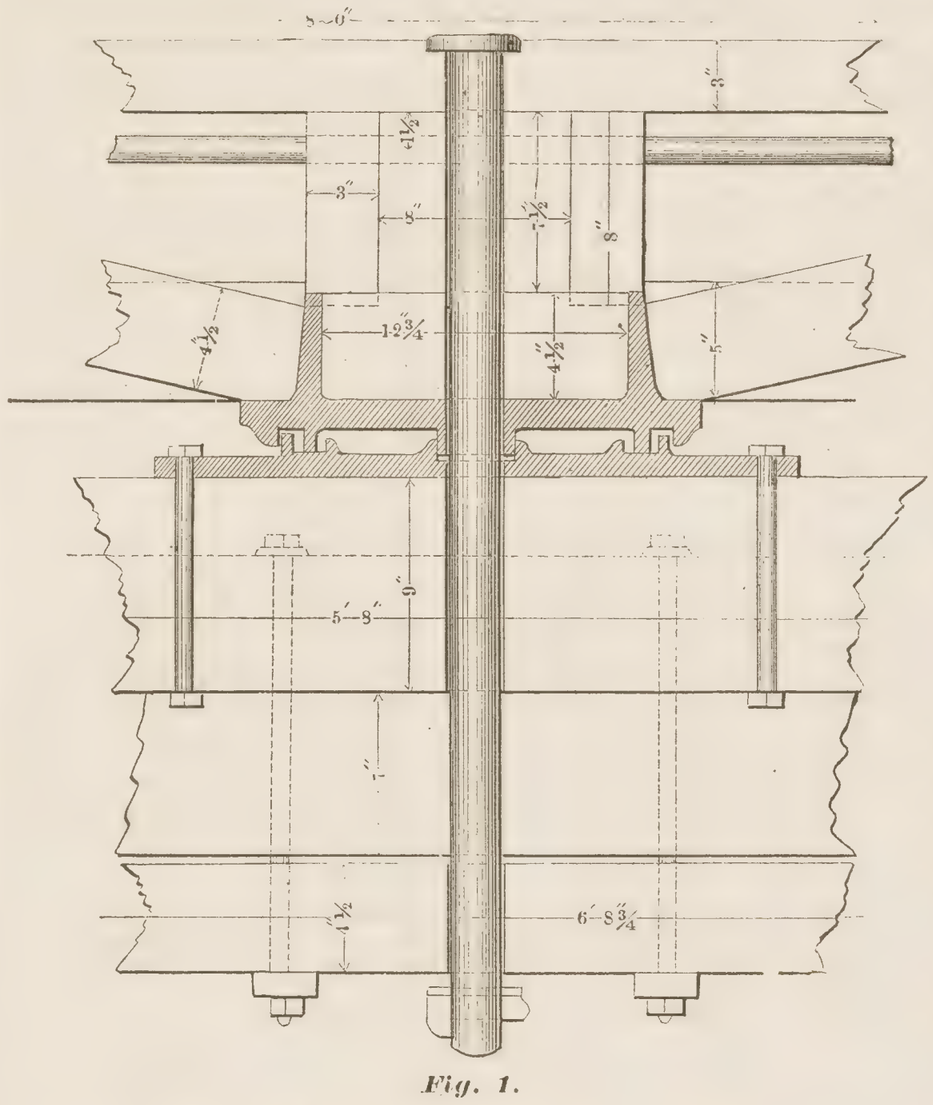


Fig. 1.

of the arrangement can be readily seen. The diameter of the lower plate being 16 inches, the bearing is farther removed from the centre than in plates of smaller size, and consequently the weight of the car-body is concentrated more upon the centre of the truck and with less dependence on the side-bearings. This diminishes the strain and friction at these points, and enables the truck to move with greater freedom

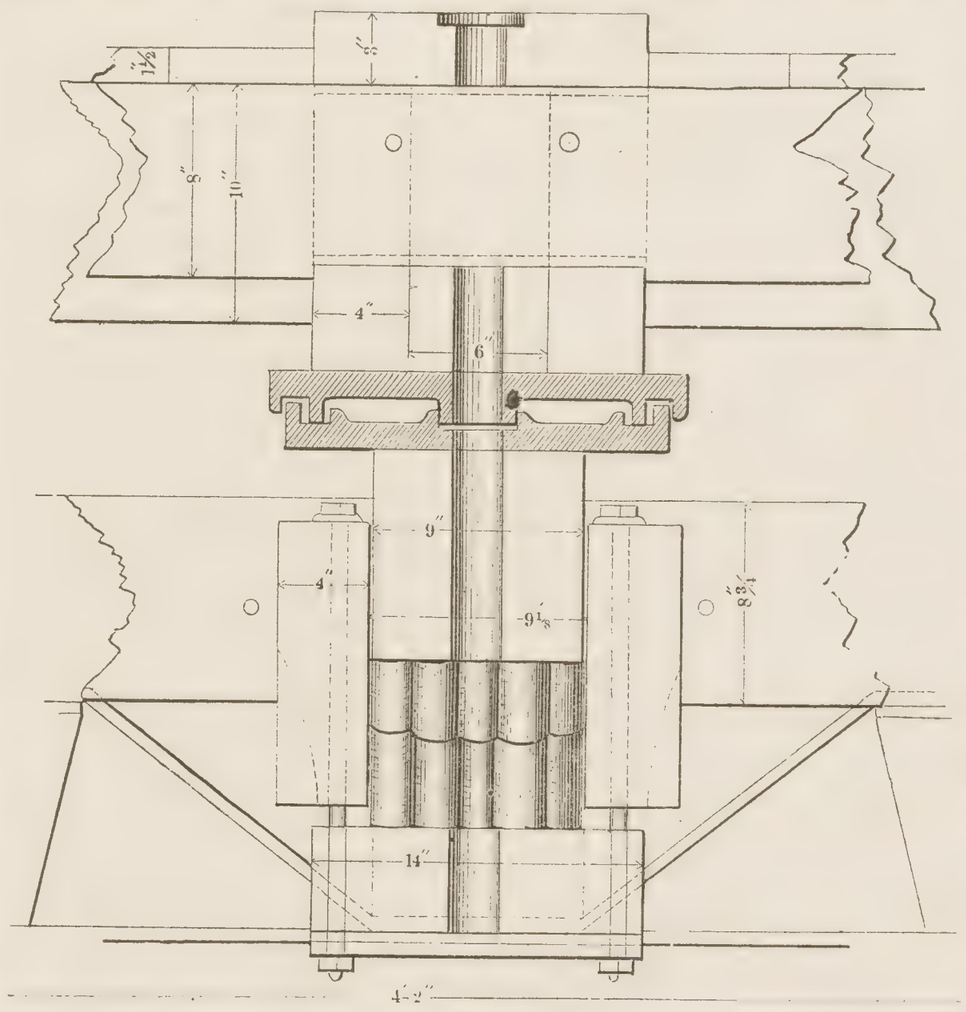


Fig. 2.

in passing curves. It will be noticed that there is no vertical bearing at the centre around the king-bolt; the upper plate, however, is fitted snugly into the lower one so as to prevent lateral vibration, the bearing being near the outer rim between two concentric rings or ribs, as shown. The space between these ribs holds the oil securely, and thus keeps the bearing-surfaces constantly lubricated. The dust is effectually excluded by the flange of the upper plate, which shuts over the outer flange of the lower one.

The body-bolster is trussed or braced by diagonal timbers extending from the sills on each side to the lugs or brackets on the upper plate, the space between the brackets being filled with wood. When the sills are not made of hard and well-seasoned timber, they may be protected from the truss-strain by angle-irons. To prevent them from spreading, a tension-rod connects them, and is held by screw-bolts, which may be tightened in case of shrinkage of the wood. The drawings are on a scale of one inch to the foot. The main advantage of this construction consists in maintaining the load in a central position on the truck. The body-bolster being so strongly braced, is prevented from sagging on the side-bearings, causing car-body and truck-frame to suffer equally with road-bed and track, and materially increasing repairs. The body-bolster can be applied to 8-wheeled cars, passenger or freight, without disturbing the car-sills or body-frame. Mr. Ambrose Ward, Altoona, Pa., is the patentee.

Italian Railroads.

A CORRESPONDENT, writing from Italy, says, "Her railroads are magnificent structures, waiting-rooms elegantly frescoed, and the seats of the finest silk velvet. When the train stops for dinner, they give you one hour to eat your meal. The railroad beds are the smoothest I have ever ridden over; the embankments are all built of solid masonry of the most substantial nature, and the bridges are all massive stone. If the bridges, embankments, and road-beds of the New-York Central Railroad were built like those of the High Italy Railway, that road, with its immense revenues, could not pay a half per cent dividend on the cost of its construction. The expense of running railroads in Italy is enormous. Every ton of coal is bought in England, costing ten dollars per ton, and transported at an enormous cost to Italy. The system is admirable. Of course I do not like the carriages; but in every other respect they excel us Americans. It is impossible for a traveler to get into the wrong train or car, even if he does not speak a word of either French or Italian. Every man connected with a railroad wears a uniform, and the guard lifts his hat to you as he politely examines your ticket. I have traveled nearly 4000 miles in Europe, on many different roads, and I never missed a train or knew one to be five minutes behind time. Surely such facts attest the excellence of the railway system in Italy."

THE St. Louis *Railway Register* says that the St. Louis, Kansas City, and Northern Railroad is now running five of their magnificent day-coaches, which are fitted up with Buck's reclining and adjustable chairs and every desirable convenience. Ten more are in process of construction and will rapidly supplant the old cars. Great attention is also given to safety. The coaches are fitted with Blackstone's couplers and platforms, which prevent telescoping and oscillation. Fully one half the iron of the main line has been replaced this season by the best quality of new iron and steel rails. A large force of track watchmen will be employed this winter, to walk over the track night and day, and keep it in repair. This system gave this road an extraordinary exemption from accidents last winter. Mr. W. C. Van Horne is the superintendent of the main line, and Mr. J. L. Hinkley, of the St. Louis division.

The National Car-Builder,

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JAMES GILLET, EDITOR.

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

A Word to our Readers.

WITH the advent of the new year, and the issue of this the first number of the fifth volume of THE CAR-BUILDER, we desire to acknowledge the support extended to us by our subscribers and advertising patrons, and to solicit a continuance of their favors in future. The great majority of our readers are connected with the mechanical departments of railways, and know something of their growth and magnitude, especially the business of car construction, with its innumerable details and the modifications and improvements which are constantly being introduced to secure greater efficiency and to meet the requirements of competition and progress. It is our aim in conducting THE CAR-BUILDER, to do all we can, with the facilities and means at our command, to promote the interests of railways in these departments. The field, however, is such an extended one, that to be able to gather into the pages of a monthly periodical *all* that is worthy of notice or of permanent record, would require a constant and careful inspection of car and machine-shops, an extensive correspondence, and the services of an efficient corps of draftsmen and engravers. As the present size and price of our paper will not warrant an expenditure adequate for all this, we shall continue to do what we can on the present basis, to make it in future, what we have reason to believe it to be already, a welcome visitor in car-shops and railway offices; and we can not refrain in this connection from asking car-builders and railway mechanics to favor us more frequently than they do, with contributions containing their views upon mechanical problems pertaining to car and locomotive construction. We would also solicit items of current railway news, notices of new devices and peculiarities in car-building, descriptions of rolling-stock, machinery, etc. This would greatly aid us in making our paper a medium of information mutually advantageous to readers and publishers. We would also request early advice of any errors in our directory. As an illustration of the singular diffidence with which many persons are afflicted in sending us any thing likely to appear in print, we frequently receive letters informing us of such errors, but couched in language extremely apologetic, and evidently written under the impression that in giving us such advice, they were taking an unpardonable liberty. We are necessarily dependent upon our readers for much local information which we could not otherwise obtain, or if we do obtain it, it is by mere chance. We trust they will respond to our needs in this respect more generously in future.

Railroad Economy.

ECONOMY in railway operation is not yet an exact science. Its general principles are getting to be better understood, but as regards the practical details, there is much diversity of opinion. This naturally results from the magnitude of the system and its rapid expansion and growth. By economy in railway management, we mean such a use of material, labor, and skill as will avoid unnecessary waste and secure most effectively the end in view. There is no other field of human effort in which it can be applied, both as a science and a cardinal virtue, to greater advantage. The prodigious wear and tear of material, the vast number of operatives, the costly and complicated machinery, and the endless details of construction and maintenance, afford an opportunity for the exercise of the highest ability in the prudent and economical use of resources. Wasteful prodigality should be avoided on the one hand, and mean and narrow parsimony on the other. The two extremes lead practically to the same goal. One squanders capital by frittering it away through a thousand leaks that increase in number and size the longer they remain unstopped; the other, in its miserly eagerness to save a pittance, sinks thousands in repairing damages caused by stupidity and incompetence. In many other departments of business and in individual expenditure, men may be reckless and extravagant or sordid and mean, without any special peril to life and limb; but in railway operation, any defect in material, or blundering incapacity on the part of officials or subordinates, vitiates, like a weak link in a chain, the whole structure. A bad piece of iron in the track or running gear is a hidden trap which may sacrifice a dozen lives in a moment, and sink a year's dividend in repairing damages and settling lawsuits. There is nothing so expensive to railroads as accidents; and these in numerous cases have their origin in the disregard of the true principles of economy—either in corrupt and lavish outlay or niggardly and penny-wise saving.

In view of the general depression in business during the past three months, and the prevailing clamor for cheap transportation, the chances are that railroad economy in the matter of mere retrenchment, will be carried to excess, even by roads with abundant resources and with a fair paying traffic. With some roads, it is a matter of choice; with others, a thing of stern necessity. The leading east-and-west lines with their heavy produce freights have already profited largely by the panic in the reduction of operating expenses, by cutting down wages, discharging needless employees, and the stoppage of numerous leaks, to say nothing of the lower prices and restricted purchase of material and supplies. The aggregate of saving will foot up a good round sum, and if the general efficiency of the roads is not impaired thereby, it is a true economy. This point, however, will appear in a clearer light a few months hence, when the old rails and dilapidated rolling-stock will have reached the limits of their usefulness. A great deal of false economy in the purchase of supplies of various kinds was in vogue before the financial crisis set in, and consisted in the use of much low-priced material which was extravagantly dear at half the money. Railway managers are apt to concern themselves more about the price than the quality, losing sight of the inflexible law of compensation, that in the long or short run they only get what they pay for. If they buy thirty-cent oil, they get nominally their money's worth according to market quotation, but what they pay for it is more than absorbed in the time and labor of taking out axles and repairing cut journals caused by its use. Rubbish and scrap are traded for job castings with their superfluous weight and increased liability to break, every pound of such weight taxing the motive power just as much as if it was essential. Southern pine lumber made from tapped trees, is bought up at a bargain and considered as good as the virgin growth. Iron rails have of late very much depreciated in quality, and instead of ten years' service, as in former times, they now wear out in from three to six years upon roads with a fair avarage traffic, and upon some of the great lines even in less time. This increases track repairing. A bad track knocks the rolling-stock to pieces, and then comes more repairing, heavier cars, more dead weight, and consequently greater cost of transportation. A great deal of bad material in the way of cheap iron and unseasoned timber, to say nothing of inferior workmanship, is put into cars in order that they may be got out at contract price without loss to the builders. The cars are worth the money, perhaps; but if the investment is a bad one for the road, it is not the builder's fault. A good car can not be furnished unless the pay is correspondingly good.

We need not go into details to illustrate this kind of economy. It is the natural outgrowth of the mania for building railroads on speculation which has prevailed for several years past, and which has at last culminated in disaster. A meagre capital, or the dearly bought proceeds of negotiated bonds, are stretched like a piece of india-rubber to cover the outlay for necessary equipment. The available means under this spreading process are found to be too thin in the middle and short at both ends; but the equipment must be forthcoming, whether it is good, bad, or indifferent. Any thing will answer in a pinch; and when the earnings begin to accumulate, it will be time enough to consider old-fashioned theories of economy. All this is demoralizing, and leads from bad to worse. It is time there was a reaction. Such a reaction will be better for the roads, better for the traveling public, better for manufacturers and dealers, and for the entire community.

The Dictionary of Terms.

IT gives us pleasure to be able to state that the committee in charge of this work, with the valuable assistance of Mr. William E. Partridge, is making daily progress in its labors. How soon it will be ready for publication can not be predicted with any certainty at this time, as a great deal yet remains to be done in the way of gathering, arranging, and classifying the multitude of details, and giving to each an appropriate name. No one who has not given the subject careful consideration can form any adequate idea of the difficulty of preparing such a work, and the time and labor necessary to complete it. The undertaking grows more formidable as the work proceeds. Much greater progress would have been made already, had the committee been supplied with the necessary material in the form of drawings, photographs, etc.; and we are now requested to state that it will be a great assistance to the committee, and insure a much earlier completion of the work, if car-builders in every part of the country will promptly furnish tracings or drawings of standard freight and passenger-cars belonging to their respective roads. It is not necessary that such drawings should be to scale or very nicely finished, but the various parts should be carefully numbered in red ink, and a schedule sent of the name or names given to each number, or by which they are known by the road. Photographs of any particular or detached parts of cars, especially castings and other iron-work of truck or body, are also very desirable. There are many parts

and details peculiar to cars in one part of the country that are entirely unknown in another part, and it is impossible for any one, two, or three persons, however familiar they may be with those pertaining to a particular road or locality, to know all the parts belonging to all cars, east, west, north, and south. This information, both as respects details and the names by which they are designated, is very essential. Not more than one or two drawings of cars, with a schedule of names and numbers, have been received by the committee. A great many more are wanted and with as little delay as possible. They are indispensable to the satisfactory progress of the work, and its early completion will be very much expedited thereby. Probably no amount of care and labor bestowed upon it would make it altogether perfect, so as to need no corrections in subsequent editions, but it is none the less important that the first one should be as perfect and as comprehensive as possible. We trust car-builders will heed this request, and give the committee their coöperation and assistance in the work it has in hand. Such tracings, drawings, or photographs may be addressed to the Master Car-Builders' Association Rooms, 113 Liberty street, New-York.

Springs for Freight-Cars.

It must be manifest to practical railroad men that the equipment of freight-cars with cheap, rigid, and unelastic bearing springs, is an expensive kind of economy, especially when such springs are insufficient in number, or from neglect or a service to which they are inadequate, the little elasticity which they originally possessed is nearly if not entirely destroyed. There are thousands of freight-cars on our roads, doing hard service, with really no springs under them except in form, taxing the motive power, pounding the track to pieces, and wearing themselves out at a rate which adds immensely to the cost of general repairs, and all this merely to save a little in the first cost of that comparatively insignificant but most essential feature of a car, a suitable and serviceable set of springs. A careful eye is kept on the spigot, while a river is leaking out at the bung-hole. We think if a reliable estimate could be made of the difference between the cost of good springs and poor ones, and such difference compared with the actual additional outlay for repairs resulting from the use of the latter, it would shed a blaze of light on one point at least of railway economy.

We know it to be the opinion of many who are practically familiar with the repairing of rolling-stock, and especially of freight-cars, that the more decided action a bearing spring has the better, and that they are as necessary on the journals as on the bolsters. Many, however, seem to labor under the impression that the rapid wear of journal springs, especially if they have considerable elasticity, is an evidence that they are in the wrong place. It is true that they wear rapidly, which proves that they serve the purpose for which they are intended, or, in other words, do their duty. Every motion they make is a blow saved to the road-bed, and so much added to the life of the rails. The reason why journal springs make the truck softer on the rails and carry the cars more easily, is because the action of the spring absorbs the shock of concussion before it can be communicated to the car-body. These springs virtually sustain the entire truck, except the wheels and axles, and of course reduce the weight which would otherwise strike a dead, solid, uncushioned blow upon the rails, to the smallest possible quantity. If equalizers are used, the weight is materially increased, and the small motion allowed to springs on the equalizers makes the truck almost as hard on the rails as if there were no springs at all.

Many car-builders would consider two inches of motion in the jaw-springs as excessive, but we can hardly regard the matter in this light when we call to mind some passenger-car trucks on one of the New-England railroads, [the total spring-motion of which is six inches. Many think that such a motion would be dangerous and liable to throw the cars from the track, and would doubtless refer to passenger-cars having not more than two inches of spring-motion. Such springs should of course have a soft, easy action. If the recoil under pressure is rapid and jerky, there might be danger. The important thing is to provide for taking up the motion at a point nearest the rail, that is, at the journal-box. The next thing to be dealt with is the jar or vibration, which can only be absorbed by a cushion. This can be provided by seating the springs on thin pieces of rubber. The value of this material as a cushion may be demonstrated by attempting to straighten a bent nail with a strip of rubber interposed between it and an anvil, and then on the anvil alone. The experiment will be conclusive. The purpose of cushioning is accomplished by placing pieces of sheet-rubber wherever metal comes in contact, at centre-plates, side-bearings, between the ends of equalizers and the boxes, and at the top and bottom of springs. Such contact and combination of rubber with metal are very effective in deadening the force of collision, because each material is specially adapted to the work it performs. Another method of cushioning, the advantages of which are beginning to be understood and appreciated, consists in the introduction of paper, wood, oakum, or other like substances into the car-wheels. Although possessing little or no elasticity, yet the effect is to materially modify the blows upon the rails.

When much motion is desirable, the springs should be long, easy, elastic, and slow-moving, and the first cost of springs of this description is necessarily greater than those of an opposite kind. On roads where the greatest amount of spring-motion is allowed and the rolling-stock thus made easy on the track, the difficulty of keeping the track in repair, even with a heavy passenger traffic and fast trains, is very small; while on freight roads with slow speed and rigid, unelastic springs, the repairs of road-bed are much greater. In cases where passenger-car trucks are used for freight-cars, and where all trains run fast, the expense of keeping the track in first-class order is less, and the endurance of the rails greater than on slow-moving freight-lines. In regard to passenger-trucks under freight-cars, the swing-motion and equalizing-bar, with the increased number of springs and vertical motion, make the freight-trains as easy to draw and as light on the road-bed as passenger-coaches; while if the freight-train speed of twelve or fourteen miles an hour should be adhered to, the wear and tear of hauling would be comparatively very small indeed. The effect of easy-riding cars on freight of every class may be estimated by reference to the milk traffic on the Erie road. Ordinary freight-cars churn the milk, even at a moderate speed, while the cars specially designed for the traffic, riding as easily and traveling as fast as a first-class passenger-car, do not injure the milk by too much agitation. The cost is of course the great obstacle in making all cars as easy as day-coaches, and it can hardly be expected that any great change in this direction will very soon be made in freight-cars. Our object is merely to call attention to the penny-wise economy of equipping freight-cars with worthless springs because their first cost is small compared with springs that are better, and making no account of the enormous subsequent expenditure rendered necessary by their use.

We are informed that Professor Lewis W. Leeds has accepted the invitation to address the Car-Builders' Association, at their next monthly meeting, on the subject of Ventilation. We hope there will be a good attendance.

The *American Artisan* has been changed from a weekly to a monthly publication. In its new form it will contain thirty-two large quarto pages.

Work has been commenced on the Gilbert Elevated Railway in this city. The roadway will be supported by iron arches spanning the street, and will not interfere with street or side-walk travel.

Car-Builders' Monthly Meeting.

The regular monthly meeting was held at the rooms of the Association, on Thursday evening, December 18th. The following car-builders were present: I. W. Van Houten, Joseph Jones, L. Garey, J. T. Leighton, M. C. Andrews, George Hackett, D. Hoit, G. W. Demarest, D. H. Baker, C. A. Smith, C. E. Garey, G. W. Bitner, Ellis Dodge, E. Lockwood, E. A. Olmstead, C. J. Holbach, Willis Davis, H. S. Billings, B. D. Phelps, and a number of other gentlemen interested in the objects of the association.

Mr. I. W. Van Houten, the President of the Association, called the meeting to order, and stated that the special subjects for discussion were the heating, lighting, and

VENTILATION OF PASSENGER-CARS.

Mr. Andrews inquired whether any experiments had been made in the way of exhausting the air at the bottom of cars and taking it in at the top.

Mr. W. G. Creamer, of New-York, said he had given considerable attention to the subject of car-ventilation. There was no necessity whatever for mystifying the subject by profound philosophical disquisitions. Ventilation could easily be secured by mechanical means, especially in cars while they were in motion. He was opposed to taking in air at the top or dome. It was the very worst place, because the gas, steam, and smoke from the locomotive would be sure to come in. The impure air should always be let out at the top and the supply introduced at the sides over the windows, or, in other words, at the "frieze" of the car. This plan worked effectively, and when properly applied, would keep the air, in a car filled with passengers, as fresh and pure as it was outside. If it was deemed expedient to introduce the air lower down, it could be carried from the frieze through the car wall to any point nearer the floor, but he thought in such case it would be too cold for the feet of the passengers.

Mr. Leighton said the essential thing was to get the impure air out and the other kind in. Foul air in cars proceeded mostly from respiration; and this, he contended, as well as the air burnt by contact with over-heated stoves, fell to the bottom of the car, and should be taken out at the bottom. This was the plan adopted in the best ventilated buildings. Side ventilators in cars were well enough so far as they let out the foul air, but they also let out the pure air along with it.

Mr. Bitner said the theory was correct as regards buildings, but it did not apply to cars—at least not to the same extent. Cars moved rapidly, buildings did not. It was impossible to build a car or use it so as not to admit air at the bottom. It came in at the doors in cold weather in excess of what was wanted, and remained near the floor. There was no draught, like a fire-place in a house, to exhaust it and draw down the warm air above to take its place. A car could not be ventilated unless the exhaust was at the top. The supply might at the same time be admitted at the sides immediately above the windows.

Mr. Leighton replied that, if the impure air in a house falls to the floor and passes out through the exhaust-ventilators at the bottom, he could not see why it should not be the same with cars. Houses had doors as well as cars. He was not talking about heating cars, but how to rid them of unwholesome air. If this air settled to the floor, how were we going to get it out at the top? He thought Judge Maine's plan a very good one, to a certain extent. By means of a deflected upward current of fresh air from the window-sills, the impure air from the bottom of the car was drawn up with it and discharged at the roof ventilators.

Mr. Creamer could not admit the premise assumed that the bad air was next the floor. Let any one take a step-ladder in a warm room containing a number of people, and climb up until his head was near the ceiling, and he would find he could not remain there ten minutes. For this reason he, (Mr. C.) always preferred a lower berth on sleeping cars. Nothing would

induce him to take an upper one, especially if the car was crowded. Air exhaled from the lungs invariably goes up, because it was warmer than the surrounding air. This may be seen by noticing one's breath on a frosty morning. If he ever built another house, he should put registers at the top of the side-walls of the rooms, to let out the vitiated air.

Mr. Leighton suggested that the gentleman put his ventilators at the top in one room, and at the bottom in another, and see which room was the best ventilated. Most churches were now ventilated at the bottom near the floor, and with the most satisfactory results.

Mr. W. E. Partridge thought that both theories were partly wrong and partly right. Air exhaled from the lungs rises because it is warm, and in a church the mass of carbonic acid exhaled by the congregation rises to the roof, from which it falls while the building is shut up during the week; consequently exhaust-ventilators near the floor afforded an outlet for it, and in this respect they were good. But these conditions did not apply to cars, where it was necessary to have a free circulation from the head and shoulders down to the feet. The warm air from the lungs or stove gradually rises, and must be let out at the top.

Mr. M. N. Forney spoke of an attempt made by the elder Mr. Winans, of Baltimore, to ventilate a ball-room. In order to ascertain more correctly the atmospheric conditions he had to deal with, a number of toy-balloons were introduced into the room to show the effect the ventilating arrangements would have upon them, and their movements were so peculiar that, in the words of Mr. Winans, "no living man could understand them." It was very doubtful whether any product of respiration would rise or fall against an opposite current. The current always carried the noxious gases with it. There was also a strong affinity between gases of different densities, causing them to unite. It was not very material whether the supply of air came from the top or bottom of a car, so it was distributed through the whole interior. He once took the trouble to test with a thermometer the difference in the temperature of the air at the top and bottom of a car in winter. The car was heated in the ordinary way, and had exhaust-ventilators open at the top, and the difference was 42°. The outside temperature, however, was not far from zero.

Mr. Leighton inquired which was the purest, the air at the top or bottom?

Mr. Forney replied that that was a conundrum he would not undertake to solve.

The discussion was continued in a desultory way for some time longer, but without eliciting any new points or reaching any conclusion, when Mr. Forney moved that Professor L. W. Leeds, who had given special attention to the subject of ventilation, be invited to address the Association at its next monthly meeting. The motion was agreed to, and Mr. Forney was appointed a committee to extend to Prof. Leeds such invitation. It was also agreed that in case the invitation was not accepted, the subject of discussion for the next meeting would be *Friction-Bearings*.

LIGHT FREIGHT-CARS.

Mr. Forney said that a prominent railway gentleman had recently suggested to him the importance of some inquiry into the practicability of such a construction of freight-cars as would reduce their weight below that of the present standard without impairing their capacity for service; and whether ordinary rolled iron in the form of channel I-beams could not be advantageously used in framing. There was a great difference in the bulk and weight of the various parts of cars made by different builders, and in use on different roads. Centre-plates, for example, varied very much in size and weight, and if a minimum could be established, it would be a saving of weight somewhere. He thought it would be a good plan, in order to bring about the desired reduction in weight, to carefully weigh all the parts made by different builders and note the difference. In this way, what was excessive might be ascertained and dispensed with. He would be glad to hear the views of gentlemen on the subject.

Mr. Van Houten said he did not believe an iron freight-car ever would be made that would be of any advantage to a railway company. There were numerous objections to them; they were not as durable as wooden cars, they were more difficult to repair, and in case of injury in a wreck, they could not be restored without virtually making a new car. He thought, however, the weight of wooden cars might be considerably reduced. Many years ago, the Pennsylvania Railroad had an attack of the "light-car" fever, and the shops were set to work to construct the best car of this description that could be designed. As there was naturally a little rivalry between the shops, he did the best he could and produced a car which weighed only 14,300 pounds. It was 28 feet long, 8 feet 6 inches wide, and 6 feet high from floor to plate, in the clear. The trucks were particularly light. The car run eight years, and required no more than ordinary repairing.

Mr. Leighton thought, in spite of all theories to the contrary, that iron cars were a good deal heavier than wood. He was once called on to inspect an iron street-car built at Salem, Mass., which was represented to be lighter than wooden cars of the same size and style; but after some difficulty, he succeeded in getting it on the scales, and it weighed nearly a quarter more than a wooden car.

Mr. Creamer referred to some first and second-class cars which came under his notice several years ago on the Northern Railway, in France. They were framed of wood, but the paneling was of sheet-iron, and of very superior workmanship. The raised part of the panel was so perfectly smooth and free from wrinkles, that he went to the shops to ascertain how it was made and found it was all hand-work, the raised part being done on an anvil. These panels were painted so that the ordinary observer would not suspect that the material was iron.

Mr. Partridge said he was called on about two years ago to inspect some iron freight-cars built for one of our roads, and they weighed from 2000 to 5000 pounds more than the average wooden car.

Mr. Smith favored light cars. They were better in a smash-up, he believed, than heavy ones; but even if they were somewhat more liable to injury on such occasions, it was better than to haul the dead weight—better, even if you wear them out, two to one, because they saved the track, motive power, etc. He had built a car which had now been running on the Erie road a year without needing any repairs. It was 29 feet long, 8 feet 8 inches wide, and weighed 17,700 pounds; had heavy axles and 500-pound wheels, and was of course broad gauge. The result for a standard-gauge car, built on the same principle, would be still more favorable. As respects iron cars, the time was not distant when they would come into use as a matter of necessity, if not economy. Our timber was failing, but our iron mines were inexhaustible; we must, however, get up a car of this kind that will, as far as possible, obviate all objections.

Mr. Bitner thought a car might be built that would not weigh over 17,000 pounds, and be just as good as any we have now weighing 21,000. He also favored iron cars. They had not yet been fairly tried, but the day was coming when they would be used and appreciated.

Mr. Leighton was satisfied that lighter cars could be made, both for freight and passenger service, that would be as strong and last just as long as those now in use. Indeed, a lighter car could be made stronger even, if it was well built and of good material. They would cost more; but no matter for that, they would pay.

Dr. Van Houten, of Jersey City, called the attention of the meeting to a specimen of grease for lubricating journals, costing only about forty cents per pound, one pound of which would go as far as four or five pounds of the ordinary kinds in use.

Mr. J. Whiteford, of Chicago, exhibited an automatic car-coupler which he has introduced on several Western roads. It is simple in construction, and can be made at a moderate cost.

The meeting then adjourned. The next meeting will be held on the 15th of January.

Railway Car-Brakes.

We invite the attention of our readers to the following circular which has recently been issued by the committee of the Car-Builders' Association on this subject. The very elaborate and interesting report made by this committee at the last annual meeting, is an evidence of what may be accomplished by energetic and well-directed effort. No amount of labor on their part, however, will enable them to make such a report at the next meeting as they desire to make, and such a one as will be expected of them, unless the members of the association, and others to whom this circular is sent, earnestly and effectively coöperate with them by furnishing the information asked for. It is an admitted fact that the reports of committees on many important subjects, called for at the annual meetings, are meagre and unsatisfactory; and the reason assigned is, that the committees' circulars are not answered. Without the necessary material in the shape of reliable information, it is impossible to prepare good reports. Let every member of the association bear this in mind, and do what he can to furnish such material. Do not defer that duty until a few weeks before the annual meeting, but begin now, and have your replies in the hands of the respective committees in time for examination, so as to enable them to frame valuable, well-considered, and well-digested reports, that will be creditable to the association and of permament value to railway interests.

To Master Car-Builders and Foremen of Railway Car-Shops:

Gentlemen: The undersigned, a committee appointed by the Master Car-Builders' Association, on the subject of Brakes, beg to submit to you the following interrogatories, framed for the purpose of eliciting information to be reported by the committee to the next annual meeting. We trust that your interest in the subject, and a mutual desire to promote the usefulness of the association, will insure an early reply to each interrogatory.

1st. What kind of material do you use for brake-shoes?

2d. What is your experience with such material?

3d. Do you use brakes on both trucks of your cars?

4th. Can the brakes be applied from either end of the car?

5th. What is your method of equalizing the pressure on the wheels when the brakes are hung on both trucks?

6th. Do you use a power-brake that gives the engineer control of the train?

7th. By what name is it known?

8th. Is it reliable in all kinds of temperature?

9th. What method have you of releasing your brakes after they are applied?

10th. In what time and distance will it stop a train of ten passenger-cars, running at a speed of twenty-five miles per hour?

11th. What is your experience as to its working and economy?

12th. Do you think a brake should be such as to be automatically applied in case of the parting of the train, running off the track, ruptue of connections, or from any similar cause?

13th. Do you know of any such brake?

14th. By what name is it known?

All replies should be written on this circular, and returned to the chairman.

R. S. Ramsay, *Chairman*,
Pennsylvania R.R., Pittsburg, Pa., Lock-Box 494.
Hugh Gray,
Chicago and North-Western R.R.
Joseph Jones,
New-York Central and Hudson River R.R.
Committee.

George W. Morris, *Sec. of Committee.*

It has fallen to the lot of the Vera Cruz Railway Company to make the last improvement in candlesticks. This invention is so simple that we publish it for imitation: When it gets dark, the brakemen light the candles and give them to the passengers to hold.

A Catechism of the Locomotive.

THAT excell nt journal, the *Railroad Gazette*, announces that, in addition to its usual variety of information pertaining to railways and railway management, the volume for the ensuing year will contain a *Catechism of the Locomotive*, commencing with the first number of the new volume. The matter of the catechism is derived from the German work by Prof. George Kosak, the Austrian commissioner for the examination of locomotive engineers, and will be adapted to American locomotives and practice, so as to give, in a plain and practical way, just such knowledge as locomotive engineers, firemen, and other railroad men need. This method of instruction may seem, from its name, to trench a little upon the domain of theology, but it is a very effective method, and we are glad to see it secularized and applied, in the way proposed, for the purpose of implanting in the minds of railway mechanics and others a more thorough elementary and practical knowledge of the greatest machine on the planet.

THE two machines which best exhibit what the ingenuity of man can do are the watch and the railroad-engine. That a machine so small that you may cover it with your fingers in the palm of your hand should be so exquisitely constructed that it reduces the element of time almost to absolute accuracy, in spite of contractions and expansions of cold and heat —so firmly put together that it feels no disturbance of jars in the train, jolts in carriages, nor the endless motions of one's person, riding, running, rowing, jumping—so strong and firm, and yet to be made of parts as fine as a hair and far more supple—must excite admiration in every one who reflects upon the great difficulties to be overcome, and how nearly they are entirely vanquished. There are some who regard the railroad-engine as still more wonderful. The perfection to which it is now brought makes it a marvel which no familiarity seems in the least to diminish. The tremendous power which it generates, the capacity of draught, the speed it attains, its perfect docility, the ease with which it does its complicated work, have no parallel among human inventions.

SOME one has devised an improvement in car-sills which, it is claimed, makes them stronger and more durable than the ordinary wooden sills. The improved sill is simply a hollow girder made of rolled iron plates, and about six inches square. The ends of the upright posts are let into the sill and extend through to the under side, to which they are securely fastened.

THE proposed tunnel between Scotland and Ireland would be about twelve miles long, and the estimated cost is $23,000,000. It would extend from a point on the north shore of Ireland near Belfast, under the Irish Sea to the extremity of the peninsula opposite in Scotland. A single line tunnel, 15 feet wide at the base, 25 feet wide at the maximum, and 21 feet high, with side walls varying from 4 to 7 feet in thickness, is proposed.

GERMANY has finally decided on practically testing the proposition of abolishing supporting telegraph poles by burying all the wires in the earth. Tubes are to be laid in shallow trenches, and through these wires are to run. If this project prove a successful one, it will no doubt meet with universal adoption. While the poles, especially in large cities, are yearly becoming more of an inconvenience, the subterranean system has been rejected on account of the difficulty it would entail in discovering faults and breaks, and the obstacles to traffic on the thoroughfares which would result from the continual digging up of the streets, which would be rendered necessary to make repairs. As the practical Teutons are obligingly going to try the new plan, we may contentedly sit in the shadows of the bulky poles and carefully observe its workings.

MR. JAMES MCGEE, the master car-builder of the Pittsburg, Cincinnati, and St. Louis Railway shops, at Steubenville, Ohio, has resigned his position. He has been in the employ of the company about twelve years, and while he has filled the above-named position, some of the finest passenger-coaches in the country have been built at these shops. The special car built for the president of the company and used by the President of the United States on several occasions, was also built here under his direction. He leaves the service much to the regret of the officers of the company and the employees in every department under his charge, and with the general hope that wherever his lot may be cast, prosperity may follow him.

HON. JAMES H. HOYT, for many years superintendent of the New-York and New-Haven Railroad, died at his residence in Stamford, Ct., on the 14th ult. Mr. Hoyt had been connected with the road, we believe, from its first opening, and resigned his position as superintendent a little over a year ago, when the road was consolidated with the Hartford and New-Haven. Since that time he has lived in retirement. He was in the 65th year of his age.

WILLIAM D. ROWLEY has been appointed master-mechanic of the Kansas City, St. Joseph, and Council Bluffs Railroad, in place of H. L. Cooper, who has gone to the Hannibal and St. Joseph, as superintendent of machinery. Mr. Rowley has been for some time master-mechanic of the Central Branch, Union Pacific road.

CONDUCTOR JOHN B. ADAMS, having served nearly thirty-three years on the Boston and Albany Railroad, has been discharged at his own request. It is stated that, during this long time of service, he has traveled more miles than any other conductor on the Boston and Albany road, and probably more than any other man living, the aggregate distance being considerably more than two millions of miles, or more than eighty times the distance around the globe.

A RECENT geological survey of the new Territories reveals the important and gratifying fact that, on the line of the Northern Pacific Railroad, in the Rocky Mountain District, there exists a coal-bearing region of 250,000 square miles in extent, the strata of available fuel buried there varying in thickness from 5 to 35 feet.

THE Pacific Railroad of Missouri has recently added to its day express-trains between St. Louis and Kansas City, a number of parlor-cars with Buck's celebrated reclining chairs. No extra charges are made, the increased popularity of the road being ample compensation for thus catering to the public desire.

THE Western railroads have been doing an immense business in the transportation of hogs. The receipts at the Chicago stock-yards from all the roads, during two consecutive weeks in December, were 205,000 and 185,000 for each week respectively.

A HOT-WATER car-heating apparatus in a Pullman car exploded while the car was standing in the Kansas Pacific depot at Denver, Col. One end of the car was demolished and the car generally was badly damaged. The accident is attributed to various causes, one account stating that ice in the pipes was the cause, while another says that "the escape-valve was weakened," whatever that may mean.

AN English court recently decided that a railroad ticket marked "good for this day only," could not be used by a passenger any other day. American courts have always ruled just the reverse of this.

THE Star Mining and Manufacturing Company, of Henderson, Ky., has a capacity for turning out six cars per day. Special attention is given to the quality of material, including timber and iron work. William H. H. Price is the master car-builder.

THE Boston and Albany Railroad Company are tearing down their old bridge across the Connecticut. It has stood about twenty-eight years with the most trifling repairs, and seems strong enough now for fifty years' service. The new bridge is about done.

THE Herrick's Car-Works, of Oswego, N. Y., are now employing a moderate force of men on three quarters time and corresponding wages.

JOHN W. GARRETT has been reëlected President of the Baltimore and Ohio Railroad Company for the ensuing year, this being his sixteenth term.

THE shops of the Portland Company, at Portland, Maine, are now running, night and day, on a contract of twenty-five locomotives for the Grand Trunk Railway.

THE BUFFALO STEAM-GAUGE COMPANY.—This company commenced its operations in 1860, since which time its business has steadily increased until it has taken rank among our most successful manufacturing enterprises. The principal articles made are steam-gauges and locomotive head-lights, upon each of which successive improvements have been made, until they have acquired a reputation for superior design and workmanship which is not surpassed by those of any other establishment in the country. The company also manufacture signal-lamps of various kinds, and of elegant design and finish. A large number of skilled workmen are employed, also machinery of ingenious construction for saving labor in perfecting the delicate mechanism of the gauges. The rough material is first taken in hand and carried through the various stages of construction until the finished artilce is produced. The principal business of the company is with railroads, although many orders are received from other sources. In addition to their gauge business, some forty or fifty head-lights are turned out every month, besides lanterns, cab-lights, etc. The members of the company are Thomas S. Ray, Charles A. Marvin, and Charles T. Ham. The first-named gentleman has been very efficient in extending the business and devising mechanical improvements. Mr. Marvin has charge of the financial department, and has been connected with the concern for four years. Mr. Ham was formerly superintendent of motive power and machinery on the New-York Central and Hudson River Railroad, and is thoroughly versed in railway and steam mechanism. The works have recently been enlarged, and the entire establishment is provided with the best facilities for the prompt filling of orders.

THE Foundry and Machine Company of Taunton, Mass., announce that they are prepared to furnish to railway companies castings of the standard oil-box adopted by the committee of the Master Car-Builders' Association, together with the housings and jaws, all of which are made from the original patterns, and fitted up ready for use. This company have the reputation of turning out excellent work, and are the first to offer these boxes in the market. We refer to their advertisement on first page.

"How old is your mamma?" asked a love-smitten old bachelor of the daughter of the widow who had enchanted him. "I don't know, sir; ma's age varies from about forty-three to twenty-five," was the artless reply, and the bachelor was disenchanted.

AN Irishman, in New-York, who was told that his employer's store had been burned down, exclaimed, "Well, I can't see how that can be, when I have the key in my pocket!"

PRISONER, (to learned magistrate:) "Has any one a right to commit a nuisance?" Learned magistrate "No, sir, not even the Mayor—no, sir, not even the Governor." Prisoner: "Then you can't commit me, for I was arrested as a nuisance, and you've decided that I am one."

A WOMAN appeared at a shop where her husband is employed, a short time ago, and apologetically said, "Jim is not well. You must excuse him from coming to work to-day. He and I had a little difficulty at the breakfast-table this morning, and he won't be able to work this week."

The Railroad Gazette

FOR 1874.

A new feature of special interest will be added to the RAILROAD GAZETTE for the year 1874, in the shape of a

CATECHISM OF THE LOCOMOTIVE,

which will give in the form of question and answer A FULL DESCRIPTION OF THE LOCOMOTIVE ENGINE, the principles of its construction and working, and instructions as to running it and keeping it in order.

This Catechism is intended especially for the instruction of firemen and locomotive runners and those who wish to qualify themselves for these positions, is elementary, and within the comprehension of all, and contains just that information about the locomotive which EVERY RAILROAD MAN OUGHT TO HAVE, and which no railroad officer who deals in any way with the running of trains can afford to be without.

This Catechism, based upon a German work, will be made essentially a new treatise, and especially adapted to American engines and practice, by M. N. FORNEY, Mechanical Engineer, assisted by PRACTICAL LOCOMOTIVE ENGINEERS, and will be fully illustrated.

The other features of the RAILROAD GAZETTE will be fully maintained. Its railroad news will be made full and accurate; its CONTRIBUTIONS FROM PRACTICAL RAILROAD MEN numerous and varied; it will have discussions of all branches of railroad business, and especially thoughtful and impartial investigations of the RELATION OF RAILROADS TO THE COMMUNITY, now absorbing universal attention.

It is believed that every railroad officer and employee who desires to keep himself ABREAST WITH THE TIMES ON RAILROADING, will find the RAILROAD GAZETTE a great help to him. Many leading Railroad men, including Presidents, Superintendents, Chief Engineers, Master Mechanics, Master Car Builders, Road Masters, Superintendents of Telegraph, Train Dispatchers, General Freight and Ticket Agents, Auditors, Bridge Builders, Professors of Engineering, Manufacturers of Tools and Materials, and Railroad Bankers, have contributed to its columns, and its circle of contributors grows constantly larger, so that it has in every department PRACTICAL INFORMATION FROM PRACTICAL MEN.

The RAILROAD GAZETTE is published at No. 73 Broadway, New-York, and No. 77 Jackson Street, Chicago, at $4 per year, in advance. Subscriptions will be received for six months at $2, and the publication of the "Catechism of the Locomotive" will be completed within the first half of 1874. Clubs of ten will be received at $35 per year.

Address and make drafts payable to

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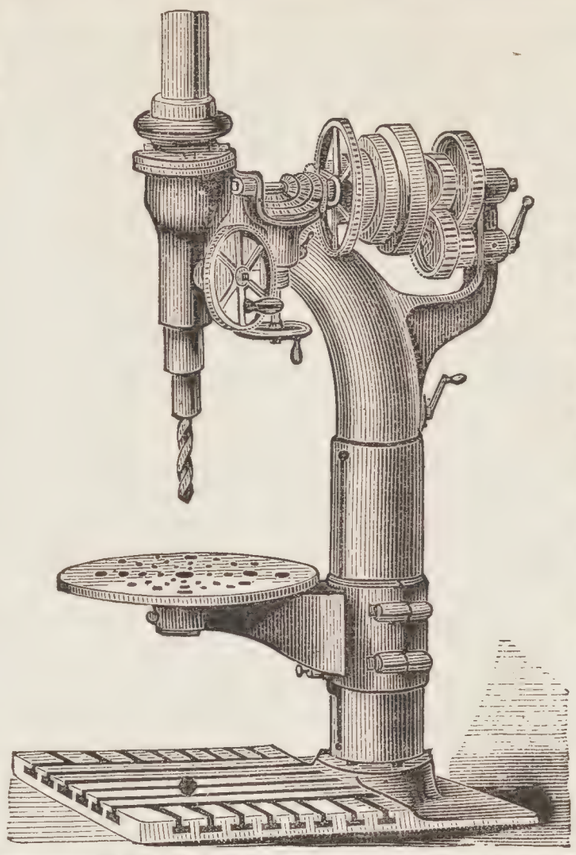
JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK PURE

This is the **ONLY QUALITY** of White Lead that we have made for the last 15 years.

JOHN JEWETT & SONS,

182 Front Street, New-York.



EDWIN HARRINGTON,

Manufacturer of **ENGINE LATHES,** from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

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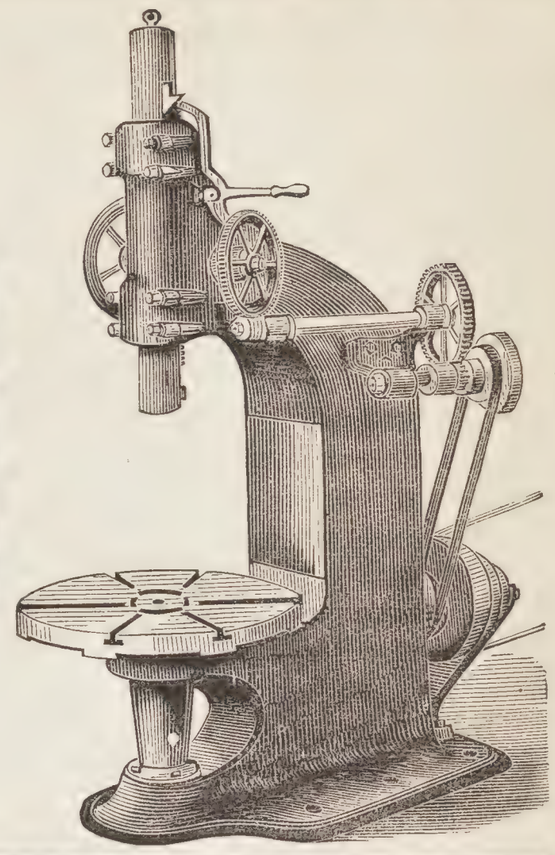
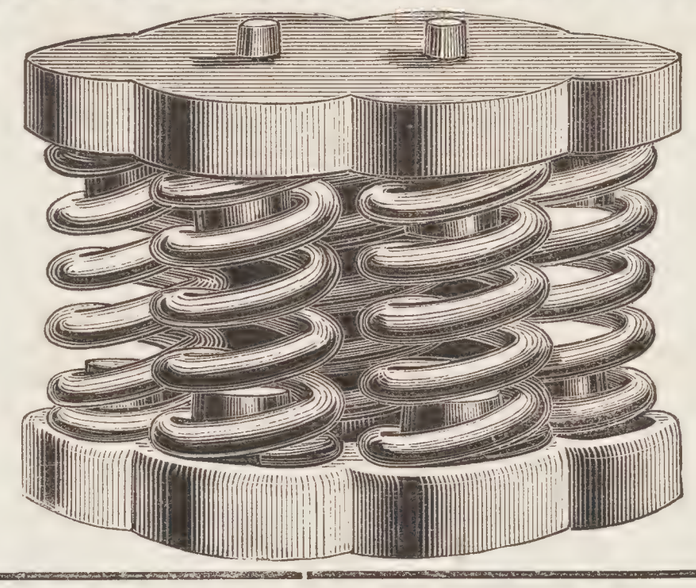


SPIRAL CLUSTER SPRING.



This Spring consists of heavy coils of Round Stee without Rubber, seated in top and bottom castings. It is strong and durable, and specially adapted to freight work. Any desired number of spirals can be grouped.

Price of 7-Spiral groups, $34 per set of four groups to a car.

Vose, Dinsmore & Co.,

MANUFACTURERS,

32 Warren Street,

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ESTABLISHED 1858.

Highest Premium awarded by the American Institute Fair, 1871.

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An Indestructible Coating for Iron, Tin, and Wood.

Prince's Metallic Paint

Is acknowledged, wherever known, to be the

BEST AND CHEAPEST PAINT IN THE MARKET.

WASON MANUFACTURING COMPANY,
RAILWAY CARS, CAR WHEELS, AND RAILWAY CASTINGS,
SPRINGFIELD, MASS., October 4, 1871.

GENTS: We have used Prince's Metallic Paint exclusively for several years. If we did not believe it to be the best we would not use it. Yours truly, GEORGE C. FISK, Pres't.

CHICAGO, BURLINGTON AND QUINCY RAILROAD,
AURORA, ILL., March 5, 1873.

GENTS: We have used your Metallic Paint about 12 years, more especially on locomotive work, and before adopting it, put it to the most severe tests of extreme heat and strong brine, at the same time testing comparatively, lead (white and red) and other Metallic Paints, and in these tests the "Prince's" came out ahead. I am satisfied that for engine and other iron work it is superior to any paint in use. Our paint-shop was painted two coats with it and boiled oil in February, 1863, and the paint is in good condition at this date, not having been painted since 1863. Respectfully, D. C. COOLEY.

For Sale, Dry and in Oil, by the Trade, and by

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96 Cedar Street, New-York.

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Tin and Roofing Plates

OF ALL SIZES AND KINDS.

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JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

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Altoona Manufacturing Co	Altoona, Pa.
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Arlington Car Manufacturing Co	Arlington, Vt.
Atlantic Car-Works	Salem, Mass.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canada Steam-Engine Co	Kingston, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
Corunna Car Co	Corunna, Mich.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Detroit Car and Manufacturing Co	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa
Freas Brothers & Thornton	Berwick, Pa.
Fremont Car Co	Fremont, Ohio.
Gardner, F. & Co	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del
Herrick Car-Works	Oswego, N. Y.
Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Indianapolis Car Co	Indianapolis, Ind.
Jackson & Sharp Co	Wilmington, Del.
Jackson & Woodin Manufacturing Co	Berwick, Pa.
Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield, Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
McNairy, Claflen & Co	Cleveland, Ohio.
Murray, Dougall & Co	Milton, Pa.
McVay, Walker & Co	Braddock's Field, Pa
Mowry Car and Wheel Works	Cincinnati, O.
Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
New-Haven Car Co	New-Haven, Ct.
Niblo, James M	Conshohocken, Pa.
Northumberland Car & Mfg. Co	Northumberland, Pa.
Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Piqua Car and Agricultural Works	Piqua, Ohio.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
Portland Co	Portland, Me.
Pullman Car Co	Chicago.
Peregoy, J. H	Houston, Texas.
Ranlet Car Manufacturing Co	Laconia, N. H.
Russell & Co	Massillon, Ohio.
Sands, William L	Pottstown, Pa.
Schall, Michael	York, Pa.
Schenectady Car-Works	Schenectady, N. Y.
Shaaber & Johnston	Reading, Pa.
Southern Car-Works	Independence, La.
South-Western Car Co	Jeffersonville, Ind.
Shoenberger & Bryant	Duluth, Minn.
Seath & Hager	Terre Haute, Ind.
St. Charles Manufacturing Co	St. Charles, Mo.
Stephenson, John & Co	New-York, N. Y.
Taunton Car Co	Taunton, Mass
Tredegar Co	Richmond, Va.
Tiffin Car-Works	Tiffin, Ohio.
Vigo Foundry and Terre Haute Car-Works	Terre Haute, Ind.
Watsontown Car Co	Watsontown, Pa.
Wharton, Thomas J	Brunswick, Ga.
Whittaker, Phillips & Co	Toledo, Ohio.
Wason Manufacturing Co	Springfield, Mass
Weimer, P. L & Bros	Lebanon, Pa.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.
Wells, French & Co	Chicago, Ill.
Wilmington Car-Works	Wilmington, Del.

Car-Wheel Manufacturers.

Albany Car-Wheel Works	Albany, N. Y.
American Paper Car-Wheel Co	Pittsford, Vt.
Atlantic Iron-Works	Portsmouth, Va.
Baltimore Car-Wheel Foundry Co	Baltimore, Md.
Barnum & Richardson Manufacturing Co	Chicago, Ill.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Bass & Hanna	Fort Wayne, Ind.
Bailey, Howson & Co	St. Paul, Minn.
Blanchard & Arnold	Milwaukee, Wis.
Boston Car-Wheel Co	Camb'gep't, Mass.
Bowler, Mayer & Brayton	Cleveland, Ohio.
Chicago Car-Wheel Co	Chicago, Ill.
Davenport, Fairbairn & Co	Erie, Pa.
Dawson Manufacturing Co	Dawson, Ga.
Detroit Car-Wheel Works	Detroit, Mich.
Fulton Foundry Co	Cleveland, Ohio.
Gill, John L. Jr	Allegheny City, Pa.
Green, D. P. & Co	St. Louis, Mo.
Hamtramck Car-Wheel Works	Detroit, Mich.
Haskell & Barker Car Co	Michigan City, Ind
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heartt, Jonas S. & Co	Troy, N. Y.
Jackson & Woodin	Berwick, Pa.
John L. Gill	Columbus, Ohio.
Lehigh Car-Wheel & Axle Works	Catasauqua, Pa.
Lobdell Car-Wheel Works	Wilmington, Del.
London Car-Wheel Co	London, Can.
Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
Middlebrook & Mack	Oswego, N. Y.
Missouri Car and Foundry Co	St. Louis, Mo.
Moore Elastic Car-Wheel Co	Jersey City, N. J.
Mowry Car and Wheel Works	Cincinnati, Ohio.
Ohio Falls Car Co	Jeffersonville, Ind.
Pettengill, Glass & Co	Cleveland, Ohio.
Quealey, W. J	Hannibal, Mo.
Ramapo Wheel & Foundry Co	Ramapo, N. Y.
Rutland Foundry & Machine Co	Rutland, Vt.
Sterling Car-Wheel Foundry	Columbus, Ohio.
Scoville, J. & N. C	Buffalo, N. Y.
St. Louis Car-Wheel Co	St. Louis, Mo.
Taylor Iron Works	High Bridge, N. J.
Thompson, Duglas	Bordentown, N. J.
Tredegar Company	Richmond, Va.
Toronto Car-Wheel Co	Toronto, Can.
Washburn, Hunts & Co	Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co	Worcester, Mass.
Wason Manufacturing Co	Springfield, Mass.
Whitney A. & Sons	Philadelphia, Pa.
Woodbury & Company	E. Cambr'ge, Mass.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.

Locomotive Builders.

Baldwin Locomotive Works	Philadelphia, Pa.
Brooks Locomotive Works	Dunkirk, N. Y.
Danforth & Cooke	Paterson, N. J
Dawson & Baily (light locomotives)	Connellsville, Pa
Dickson Manufacturing Co	Scranton, Pa.
Grant Locomotive Works	Paterson, N. J.
Hinckley Locomotive Works	Boston, Mass.
Manchester Locomotive Works	Manchester, N. H.
Mason, William	Taunton, Mass.
McKay Iron and Locomotive Works	Jersey City, N. J.
Portland Company	Portland, Me.
Porter, Bell & Co. (light locomotives)	Pittsburg, Pa.
Pittsburg Locomotive Works	Pittsburg, Pa.
Rogers Locomotive Works	Paterson, N. J.
Rhode Island Locomotive Works	Providence, R. I.
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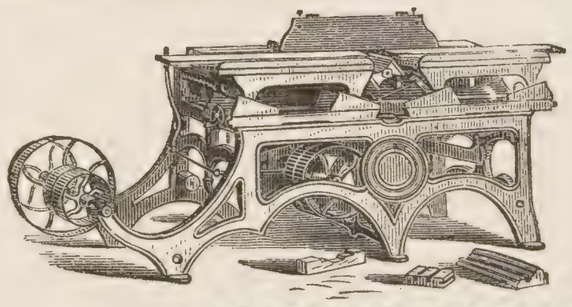

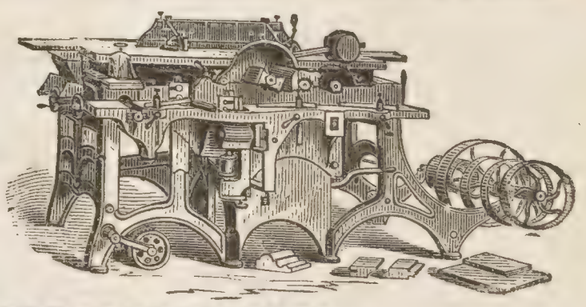

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Atchison & Nebraska	Selah Williams		Atchison, Kan.
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Atlanta & West-Point	R. D. Cole	R. D. Cole	Newnan, Ga.
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Atlantic & Great Western	‖J. B. Miller.	S. V. Smith	Kent, Ohio.
Atlantic & Great Western	Allen Cook	J. W. Holmes	Galion, Ohio.
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Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
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Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.
B			
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Baltimore & Ohio		James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott		Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
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S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, Ohio.
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Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe.	H. D. Landis	H D. Landis	Bellefonte, Pa.
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Boston & Albany	A. B. Underhill	W E. Chamberlain.	Allston, Mass.
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Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
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Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D C. Richardson.	Lawrence, Mass.
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Boston, Lowell & Nashua		S. A. Davis.	Nashua, N. H.
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Blue Ridge			Anderson. S. C.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
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C			
Cairo & Fulton	L. Finlay	L. Finlay	Little Rock, Ark.
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Camden & Amboy	F. B Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern	C. E. Benton	C E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	A. J. Prescott	C. D. Ellis	Catawissa, Pa
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach.	Catasauqua. Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
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Chesapeake & Ohio	§T. J. Hamer	H. C. Bossinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
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Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
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Western Division	W. C. Faulkner		Battle Creek, Mich.
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Galena Division	D. Manning	Hugh Gray	Chicago, Ill.
Wiscon. Mad. & Mill. Divis	T. B. Tilton		Chicago, Ill.
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Peninsula Division			Escanaba, Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender		Burlington, Iowa.
Eastern & Middle Division		W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	J. D. Besler	Galesburg, Ill.
Quincy Division	Joel West		Cresson, Iowa.
Burlington Division	S. E. Burtch		Burlington, Iowa.
Buda Division	P. R. Sutton		Buda, Ill
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch.	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	A. B. Bedell	W. H. Dunham,	Danville, Ill.
Chicago, Danville & Vincennes	J. M. Sanborn		Chicago, Ill.
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Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Divison	D. Carmichael.	D. Carmichael	Delaware, Ohio.
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Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen.	W. H. H. Allison.	Cincinnati. Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gorse		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster. Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn	John Y. Beattie	Sandusky, Ohio.
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Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas.
Central R. R. of Iowa	F. B. Woodruff	T. L. Seevers	Marshall, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
D			
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Davenport & St. Paul's	James Russell		Peoria, Ill
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison.	Cincinnati. Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa.
Morris & Essex Division	W. H. Lewis	L S. Barber	Hoboken, N. J.
Des Moines Valley	James Lamb	R. E. Smith	Keokuk. Iowa
Detroit, Ft. Wayne & Logansport.	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit. Mich.
Detroit. Lansing & Lake Michigan.	Tho. G. Roberts		Detroit, Mich.
Delaware & Hudson Canal Co	James Dickson	Thomas Orchard.	Carbondale, Pa.
Rensselaer & Saratoga Div.	John Dikeman		Troy. N. Y.
Dorchester & Delaware			Cambridge. Md.
Dubuque South-western	J. M. Smith	J M. Smith	Farley. Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
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Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East-Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
East Pennsylvania		Samuel Reeves	Reading, Pa
Elizabethtown and Paducah	W. D. Robb	T. A. Cordrey	Elizabethtown. Ky.
Erie Railway.	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna. Pa.
Erie Railway	‖V. Blackburn		Jersey City, N. J.
Erie Railway	‖J. G. Hubbard	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E Cooper	W. E. Cooper	Hornellsville, N. Y
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa
Evansville, Terre Haute & Chicago			Terre Haute, Ind.
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown. Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Jno. G. Coulon		Galveston, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me
Grand Trunk	†Richard Eaton	J. W. W. McWood.	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Sol. Bills	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne. Ind
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
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Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	J. T. Price	J. T. Price	Helena, S. C.
H			
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Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover. Pa.
Hannibal & St. Joseph	**H. L Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
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Housatonic	C. R. Morris	J J. Ferris	Bridgeport, Ct.
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Houghton & Ontonagon			L'Anse, Mich.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	J. Salisbury	M. Tellerhoof	Saxton. Pa
Hempfield	T. Marsh		Wheeling, Va.
I			
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Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes.	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia. Ill.
North Division	J B. Edams.		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo. Iowa.
Iowa & Missouri State Line			Farmington. Iowa.
Iron	Perry Scott.	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. T. Sanford	R. B. More.	Mattoon. Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Ionia & Lansing	H. Loughlin		Lansing, Mich.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft Kearney Div	**L. H. Waugh		Wyandotte. Kansas.
Arkansas Valley Div	**L. H. Waugh.		Wyandotte, Kansas.
Kalamazoo. Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff.	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas.	Chester, S. C.
L			
Lake Erie & Louisville	John Pero.		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey	E. R. Brown	South Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton. Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Lexington & Big Sandy	Fred. Weber	R. Brainard	Ashland, Ky.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta. Ark.
Little Miami	J. H. Setchel.		Cincinnati, Ohio.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson.	Ellis Dodge	Hunter's Point, IL.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.
M			
Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John E lis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Macon & Western	D. M. Gogul	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta & Pittsburg	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	M. Thornton	M Thornton	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe. Ohio.
Memphis & Little Rock	Tho. Rennells	P. Twitchell.	Argenta, Ark
Memphis & Charleston	A. Ross	A W. Drew	Memphis. Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point. Wis
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn
Mississippi Central	Henry Gibbon	John E. Becton	Water Valley. Miss
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Mississippi, Gains. & Tus			Gainsville, Ala.
Midland Pacific			Nebraska City, Neb
Milwaukee & Northern		W. J. F. Liddell	De Pere. Wis.
Milwaukee & St. Paul	T. S. Davis	Wm. E. Kittredge	Milwaukee, Wis.
Milwaukee & St Paul		John Baillie	Milwaukee. Wis.
Milwaukee & St. Paul	J. Pattee	D. F. Wilson	Minneapolis. Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Grand River Valley Division		James Potts	Jackson, Mich.
Jackson, Lans'g & Saginaw Div.	Andrew Wilson	Andrew Wilson	Jackson Mich.
Montgomery & West-Point	J. McVey	J T. Daniels	Montgomery. Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C D Wall		Girard. Ala.
Mobile & Ohio	L. J. Fleming	John McHugh	Mobile, Ala.
	B. S. Skates	Jacob Huy	Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte. Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville. Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Canaan			New Canaan, Ct.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	Fredericton, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	††Joseph Jones	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N Y
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls. N. Y.
Hudson River Division	‡Wm. Buchanan	John McKenna.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y.
New-York & Oswego Midland	‖Wm. H. Griggs	Wm. H Griggs	Oswego, N. Y.
Eastern Division	J. F. Sechler	J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas H. Anderson	Providence. R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven. Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford. Ct.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Haven & Derby			New-Haven. Ct.
New-Lisbon			Leetonia, Ohio.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, Jackson & Gt Northern	N. Greener	N. Greener	New-Orleans, La.
New-Haven, Hartford & Springfield			Hartford. Ct.
Naugatuck	Henry Hanford	George. W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B G. Sergeant	Co. Shops. N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New Orleans, Mobile & Texas	J. R. White	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon. Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North Eastern	D. W. Haines	A. M. Corrie	Florence, S C.
Northern	James W. Lander	Albert Langmaid	Concord, N. H.
Northern of New-Jersey	T. W Demorest		New-York.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div.	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
O			
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa
Oil Creek & Alleghany River	H.J.Bookhammer	Jacob Williams	Oil City, Pa.
Oil Creek & Alleghany.	H.J.Bookhammer.	John Monks	Oil City, Pa
Ohio & Mississippi		G.Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott	Chas. Hyatt	East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	J. D. Linning		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	John Hewitt	St Louis, Mo.
Pennsylvania	§§F. Thomson		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa
Pennsylvania	E. L Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	John Headden	David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	James F. Elder	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester. Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa.
	W. L. Holman		Kane. Pa
	W. T. Smith.		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa
Pittsburgh, Cincinnati & St. Louis			
Pittsburgh & Columbus Division	E. Pierce		Dennison, Ohio.
Pittsburgh & Columbus Division			Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio
Little Miami Division	J. H. Setchel		Pendleton. Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlain	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria. Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech.	Pittsburg, Pa.
Pittsburg. Fort Wayne & Chicago	S. M. Cummings	John Marquis.	Allegheny, Pa.
Pittsburg. Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Washington & Baltimore	A. S. Kinsey		Pittsburg, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland. Me.
Port Royal.	C. W. Furber	E. Hubard	Port Royal, S. C.
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village N H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester.	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Q			
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.
R			
Raleigh & Gaston.	J. B. Gayle	J. B. Gayle	Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	H, Longest	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River.	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome. N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome. Ga.
Rochester & Genesee Valley.	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Lake Superior			New-York City.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame	Prescott. Canada.
St. Louis & Iron Mountain	O. A. Haynes	Oscar Doolittle	Carondelet, Mo
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	Geo. H. Griggs	M. Heitzman	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M.Gogul	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith.		Waterloo, C. E.
Seaboard & Roanoke	§E. G. Ghio	J. B. Pendleton	Portsmouth, Va
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Daughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Maynes	W W. Peirce	Selma, Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Sheboygan & Fond du Lac	A. F. Wallace.	A. F. Wallace.	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N. Y.
Sycamore & Cortland			Sycamore, Ill.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	H. M. Smith.		Nashville, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.
T			
Taunton Branch.	W. M. Parks	J. G. Codding	Taunton, Mass.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn.
Toledo, Wabash & Western	**G. W. Cushing		Fort Wayne, Ind.
Toledo, Wabash & Western		David Hoit	Toledo. Ohio.
Toledo, Wabash & Western			Springfield, Ill.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.
U			
Union Pacific	§I. H Congdon	Geo. E. Stevens	Omaha, Nebraska.
Utah Central	Thos. Pierpont	Edward Cox	Salt Lake City.
Utica & Black River	Wm. E. Granger	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vicksburg & Brunswick	James Boon	J. A. Knight	Eufaula, Ala.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vineland			Vineland, N. J.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland. Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.
W			
Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wicomico & Pocomoke			Berlin, Md.
Wilmington, Columbia & Augusta	George Hall	W. J. Calais	Wilmington, N.C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	Jas. F. Van Horn		Coatesville, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina.	J. D Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria. Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James E. Gregg		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Albany, N. Y.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	R. C. McCalla	J. C. Stanton, Jr.	Chattanooga, Tenn.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First and Second Division	A. L. Dunbar		" "
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormly		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. L. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J. N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	J. B. Winslow		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	William Greene	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & Fulton	J. H. Morley	W. H. Hallett	Little Rock, Ark.
Cairo & Vincennes	L. W Palmer		Cairo, Ill.
Camden & Atlantic	E. Collings		Camden, N. J.
Canada Southern	*J. S. Casement		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Sacramento & Oregon Division	J. A. Fillmore		Sacramento, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond. Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	J. H. Stewart		Madison, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. T. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	R. C. Tate		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Pekin & Southwestern	N. J. T. Dana		Streator, Ill.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough		Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Akron, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati, Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	M. M. Martin		Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	E. H. Waldron	J. W. Haight	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Colorado Central	T. E. Sickles		Golden, Col.
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Wm. M. Parker		Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning & Tioga	L. H. Shattuck		Blossburg, Pa.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. S. Meckling	J. S. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Urbana, Ill.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware, Lackawanna & Western	W. F. Halstead	G. W. B. Cushing	Scranton, Pa.
Morris & Essex Division	Andrew Reasmer	G. W. Bleashing	Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus Division	George F. Thompson		Utica, N. Y.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Des Moines Valley	John Givin	G. E. Kilbourne	Keokuk, Iowa.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese		Detroit, Mich.
Dorchester & Delaware	D. Stewart Hessey		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa

E

East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)	J. Prescott	C. W. Pratt	Boston, Mass.
Elizabethtown & Paducah	D. Brock	D. Brock	Elizabethtown, Ky.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo. N. Y.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Erie & Pittsburg	John M. Kimball	Wm. Mullins	Erie, Pa.
Evansville & Crawfordsville			Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	G. C. Kimball	G. C. Kimball	East-Saginaw, Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L. I.
Fort Wayne, Jackson & Saginaw	W. A. Erust	H. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson		Augusta, Ga.
Gilman, Clinton & Springfield	S. H. Melvin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich
Grand Rapids & Indiana		William Mullins	Pittsburg, Pa.
Grand Trunk	C. J. Brydges	John Taylor	Montreal, Canada.
East Division	Henry Bailey		
West Division	W. J. Spicer		
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin	D. N. Kelly		New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne		Hannibal, Mo.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top	J. McKillips	B. A Knight	Huntingdon, Pa.

I

Illinois Central	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	George L. Barringer		Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell		Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.
Iowa Midland	J. B. Watkins		Clinton, Iowa.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	S. Conant		Jacksonville, Fla.
Jefferson, Madison & Indianapolis	Horace Scott	Wm. Mullins	Louisville, Ky.
Junction & Breakwater	John A. Sheaff		Lewis, Del.

K

Kansas Central	A. E. Buchanan		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		Detroit, Mich.
Kansas Pacific	Edward S. Bowen		Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	George Noble		Lawrence, Kansas.
Smoky Hill Division	O. H. Dorrance		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Knox & Lincoln	C. A. Combs	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound	G. W. B. Cushing	Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card		Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	Chas. B. Peck	E. O. Foote, Jr.	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
	L. Chamberlin		Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahoney Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.			Cincinnati, Ohio.
Long Island	I. D. Barton	Oliver Charlick	Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Robert Meek		Clarksville, Tenn.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	M. Stanton		Birmingham, Ala.
Louisville, Cin. & Lexington	George Skinner	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	M. Sloat	J. R. Parker	New-Albany, Ind.

M

Macon & Brunswick	William McRae	Solomon Hass	Macon, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta & Pittsburg	A. J. Warner	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	C. E. Van Cleve	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	George A. Burt		Carthage, Mo
Memphis & Little Rock	A. S. Livermore		Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis. Tenn.
Michigan Central	H. E. Sargent		Chicago, Ill.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Michigan Central		John Newell	Detroit, Mich.
Grand River Valley Division	Chas. Desmond		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	Geo. C. Hopper		Saginaw City, Mich.
South-Haven Division	Geo. E. Curtiss		Kalamazoo, Mich.
Joliet Division	Carlton Wheeler		Joliet, Mich.
South-Bend Division			
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse		Lincoln, Neb.
Milwaukee & Northern	J. W. Crippin		Milwaukee, Wis.
Milwaukee, Lake Shore & Western	W. Elwell		Sheboygan, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Milwaukee & St. Paul	*S. S. Merrill	Rob't Wason	Milwaukee, Wis.
Mineral Point	G. W. Cobb		Mineral Point, Wis.
Mississippi Central	R. N. Colquhoun		Water Valley, Miss.
Miss ssippi Central		A. S. Roberts	New-Orleans, La.
Mississippi & Tennessee	M. Burke	M. Burk	Memphis, Tenn.
Mississippi Valley & Western	E. P. Buell		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	F. W. Bowen	G. M. Babcock	Sedalia, Mo.
Cherokee Division	W. H. Adams		Chetopa, Kansas.
Choctaw Division	S. G. Eddy		Holden, Mo.
Eastern Division	Mark M. Towne		Hannibal, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Heaning	Allen Bowen	Kansas City, Mo.
Mobile & Ohio	L. J. Fleming	C. E. Rushing	Mobile, Ala.
	Cecil Fleming		Mobile, Ala.
	E. S. Hosford		Macon, Miss.
	M. M. Miller		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.

N

Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart	Thomas Williams	St. Stephen, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey Southern	M. W. Serat		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, Jackson & Great Northern	L. H. Sellars	A. S. Roberts	New Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. M. Wilcox		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast	C. V. DeForest	Albany, N. Y.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland	C. W. Douglas	P. Bundy	Jersey City, N. J.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
Northern Pacific	*C. W. Mead		St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	J. W. Green		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	J. S. Redfield		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	S. S. Solomon		Charleston, S. C.

O

Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	J. J. Lawrence		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	R. R. Cable		Rock Island, Ill.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.

P

Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	* A. J. Cassatt	Enoch Lewis	Philadelphia, Pa.
New-York Division	F. W. Jackson		Jersey City, N. J.
Amboy Division	Isaac S. Buckalew		Trenton, N. J.
Belvidere Division	J. A. Anderson		Lambertville, N.J
Western Pennsylvania Division	Robert Neilson		Blairsville, Pa.
Lewiston Division	Persifer F. Smith		Lewiston, Pa.
Bedford Division	Wm. H. Brower		Bedford, Pa.
Pensacola & Louisville	Daniel H. Cram		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin	E. Lewis	Erie, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Blair		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	Hugh Pitcairn		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Pittsburg, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	Richard Wiggin		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	S. C. Millett		Port Royal, S. C.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y.
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.

Q

Quincy, Alton & Illinois	N. D. Munson		Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*

R

Richmond, York River & Chesapeake	Reuben Foster	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	R. L. Stainback		Richmond, Va.
Rockford, Rock Island & St. Louis	R. R. Cable		Rock Island, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.

S

St. Lawrence & Ottawa	R. Luttrell		Prescott, Can.
St. Joseph & Denver City	L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln		St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St. Louis, Mo.
St. Louis & Iron Mountain	Arthur W. Soaper	W. S. Cuddy	St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. W. Gardiner	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	A. E. Shrader		Henderson, Ky.
St. Louis, Kansas City & Northern	W. C. Van Horne	R. W. Green	St. Louis, Mo.
St Louis Division	J. L. Hinkley		St. Louis, Mo.
St. Louis, Vandalia, Terre Haute & Ind	John E. Simpson		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V.	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific			
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke	J. B. Pendleton	J. A. Walton	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	E. G. Barney		Patona, Ala.
Sheboygan & Fond du Lac	J. A. Bentley	Brandon Mozley	Fond du Lac, Wis.
Shenango & Allegheny	G. H. McKibbin		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern			Sodus Point, N. Y
South-Shore	J. R. Kendrick		Boston, Mass.
South-Side, Long Island			
South-Carolina		A. Mitchell	Charleston, S. C.
Southern Central	James G. Knapp		Auburn, N. Y.
Southern Minnesota	*H. W. Holley		Wells, Minn.
Southern Pacific of California	A. N Towne		Sacramento, Cal.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield & Ill. South-Eastern	G. W. Norris		Springfield, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	R. A. Packer		Towanda, Pa.
Syracuse Northern	C. B. Morse	C. B. Morse	Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing	Syracuse, N. Y.

T

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Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	John F. Dixon	J. F. Dixon	Marshall, Texas.
Toledo, Peoria & Warsaw	W. H. Cruger	J. A. Winner	Peoria, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. J. Nessle	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio
Western Division	Robt. Andrews		Springfield, Ill.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.

U

Union Pacific	T. E. Sickles	T. E. Sickles	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
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V

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Vermont Central	J. W. Hobart		St. Albans, Vt.
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New-London Northern	G. T. Benedict		New-London, Ct.
Vicksburg & Brunswick	Virgil Powers	H. Young	Eufaula, Ala.
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Western Maryland	John T. Rigney	John T. Rigney	Baltimore, Md.
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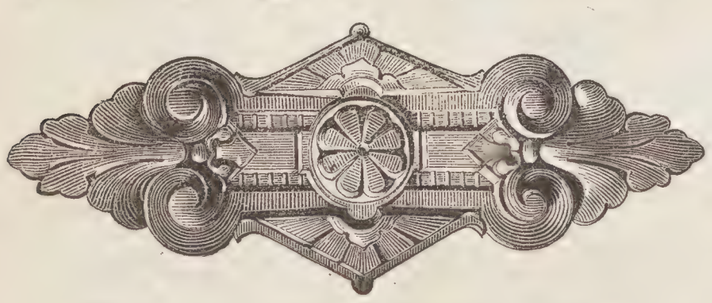

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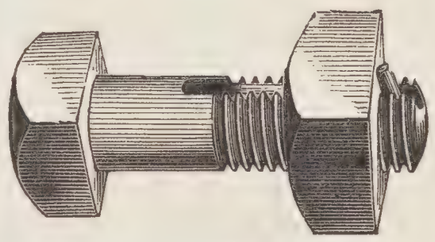
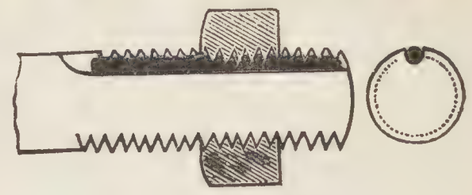


"CUMMING NUT-LOCK,"

Patented

June 16, 1868,

August 23, 1870.



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This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

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If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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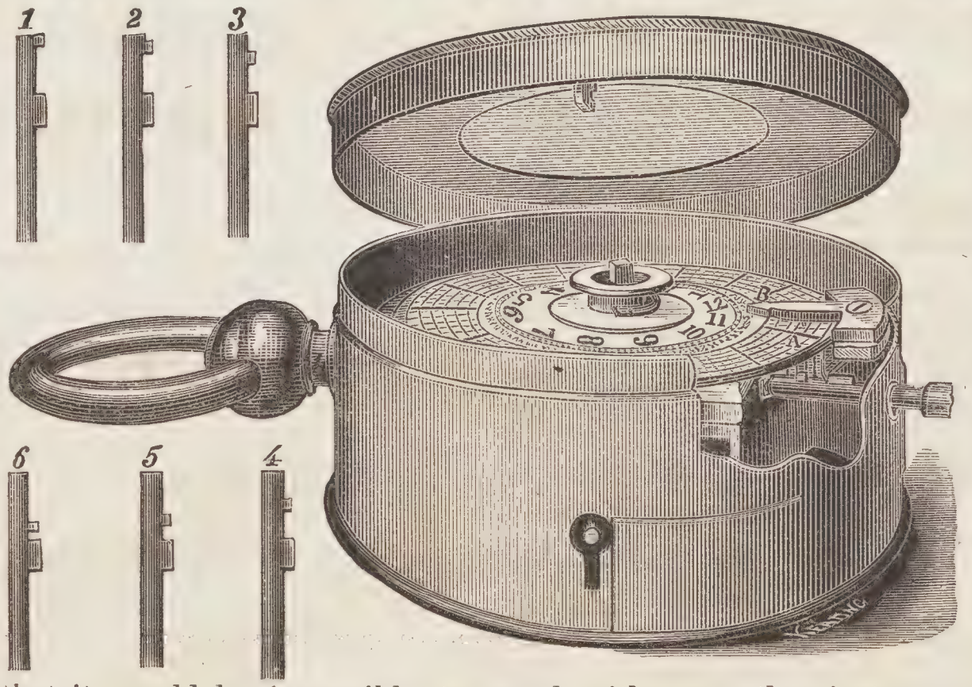

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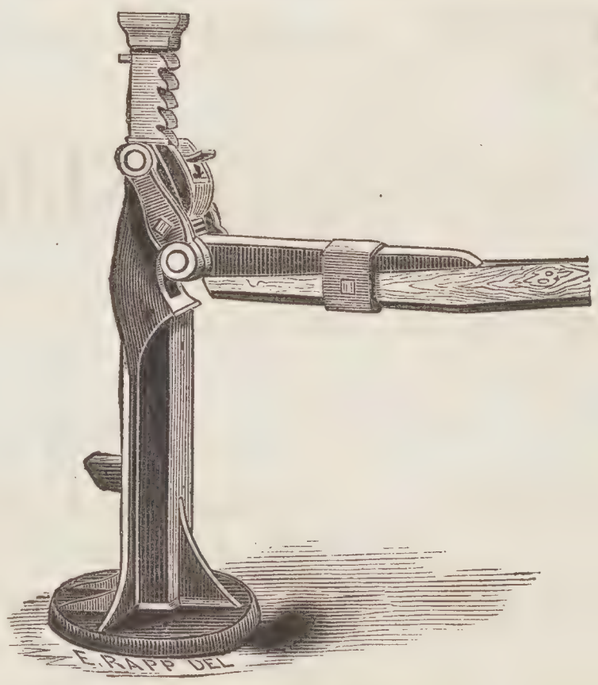

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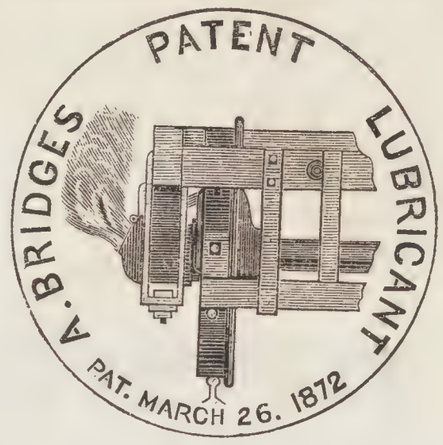

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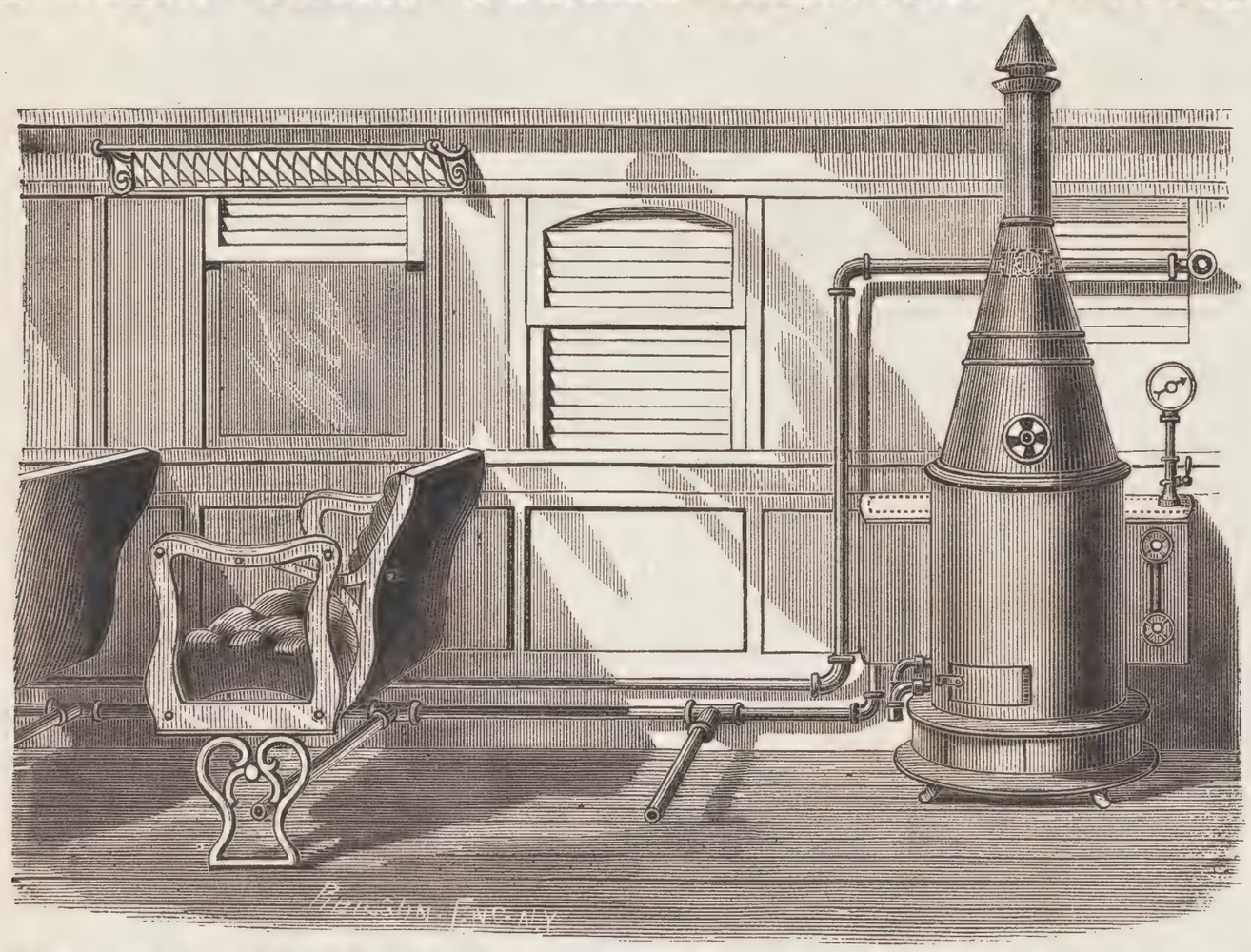

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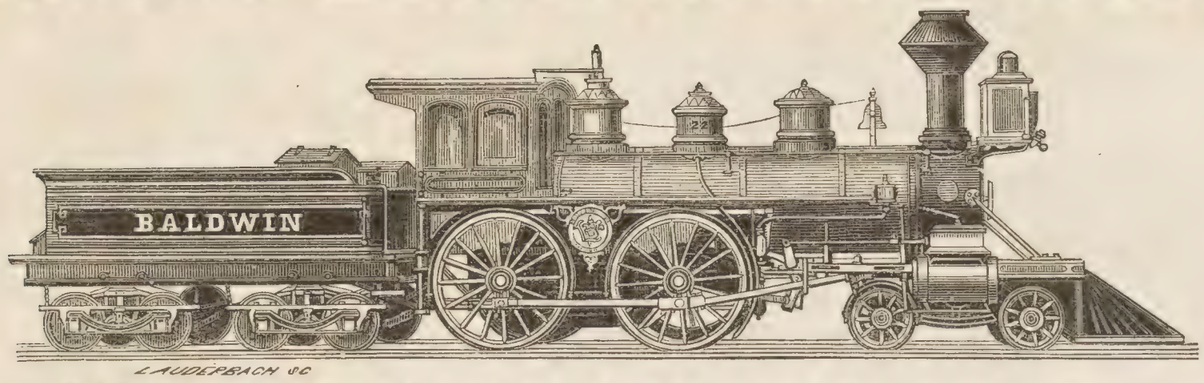

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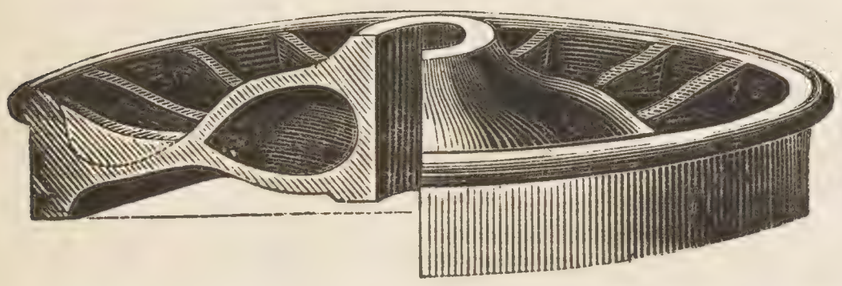

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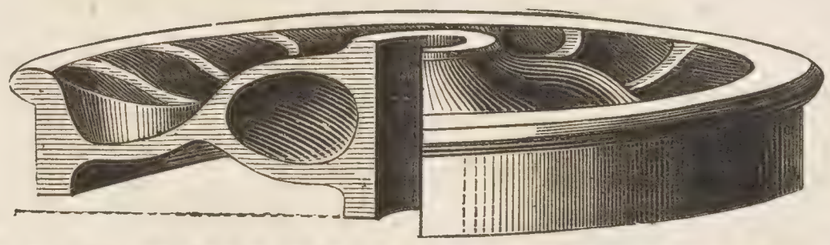

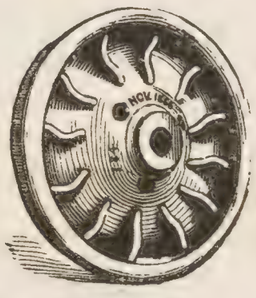

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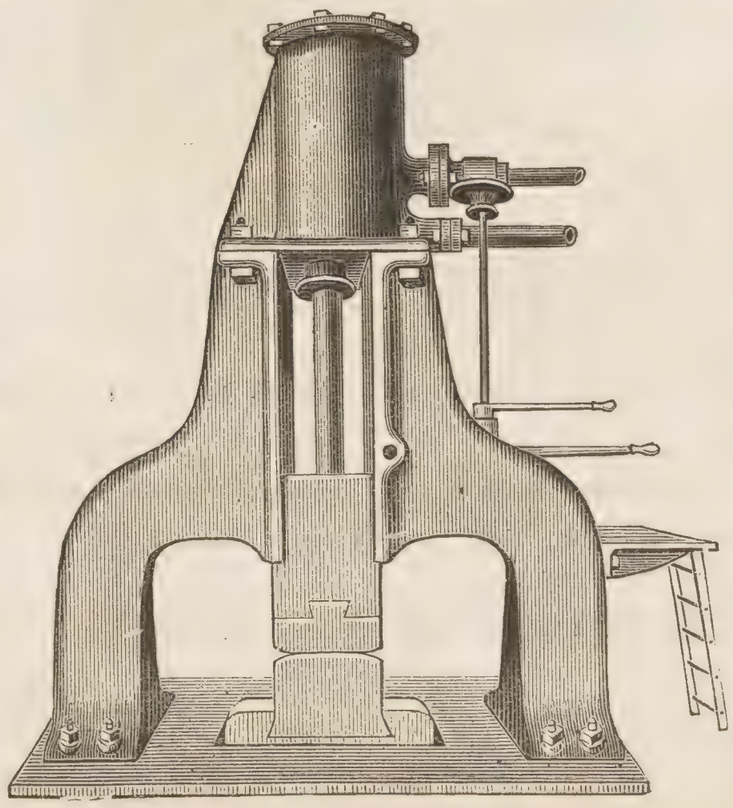

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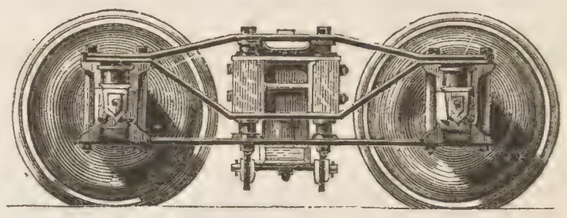

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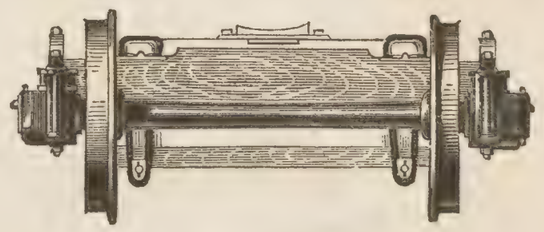
It takes the curve like a boat in the water, does not press out or endanger the rails in passing curves, saves the flanges on the wheels and prevents skidding. It is elastic, and enables the motive power to start with greater ease and with a greater number of cars, the vibration overcoming the inertia or rest upon the track. The leading features of the patent are the mechanical means employed by which the result is obtained. For the mechanical combination, the reader is referred to the patent issued April 24, 1866.



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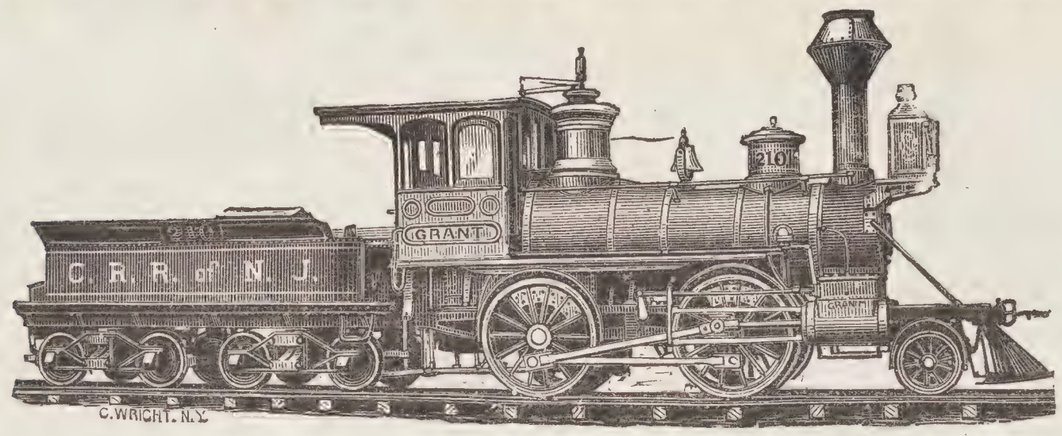

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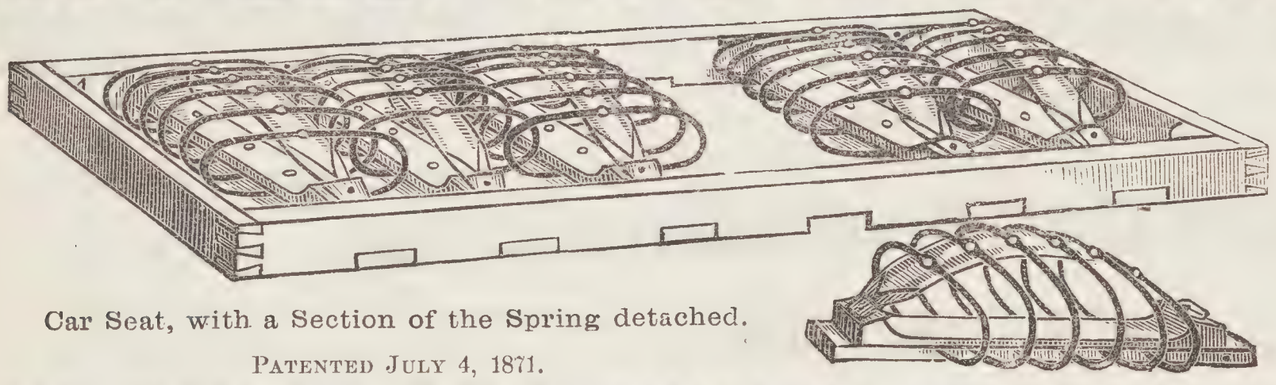

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PATENTED JULY 4, 1871.

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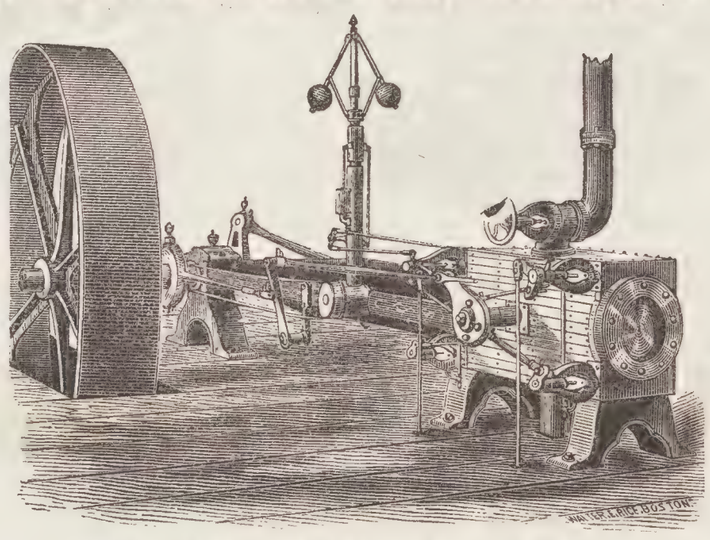

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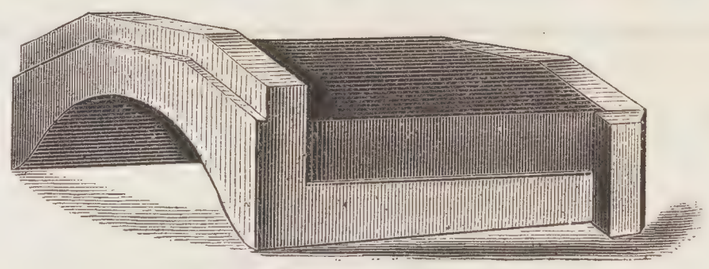

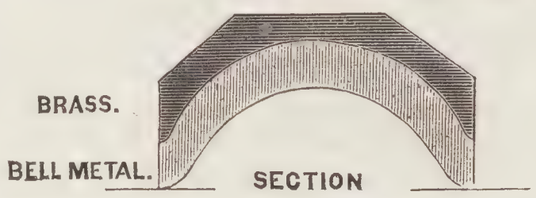

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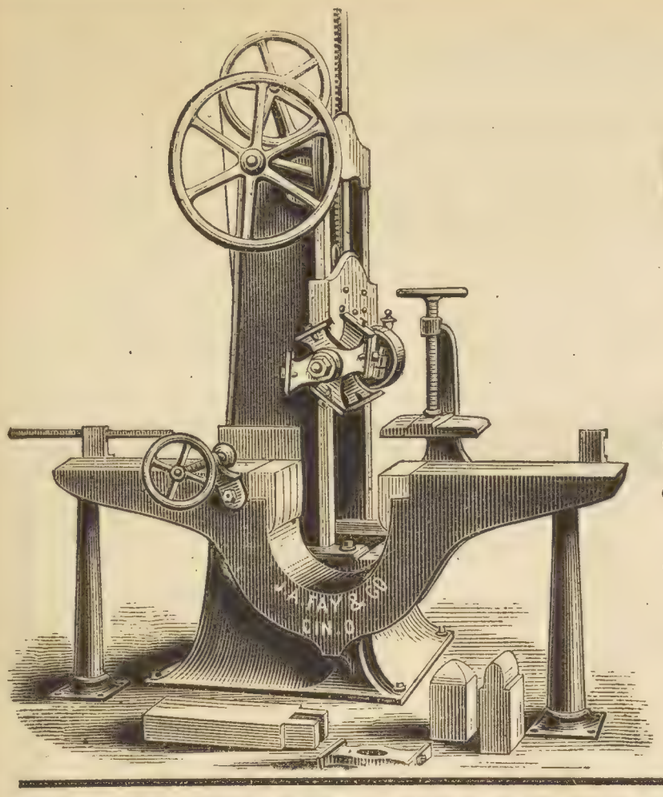

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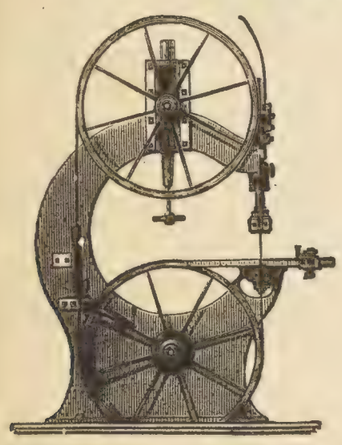

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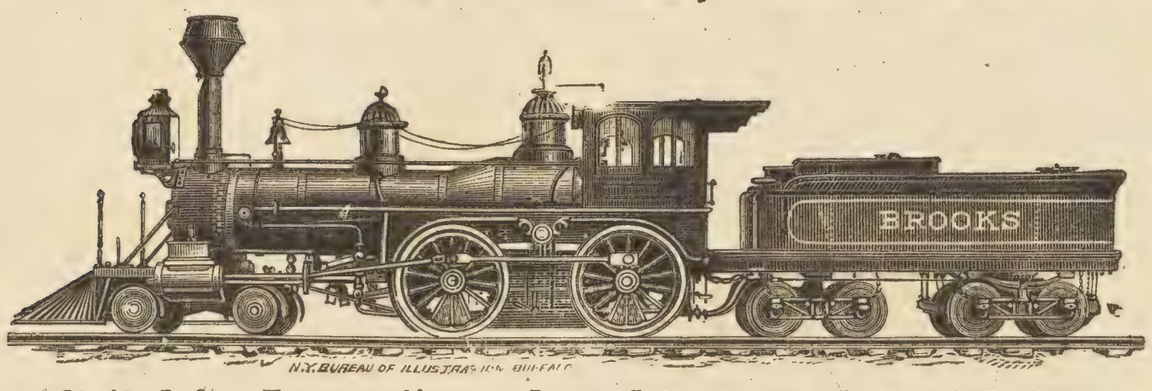

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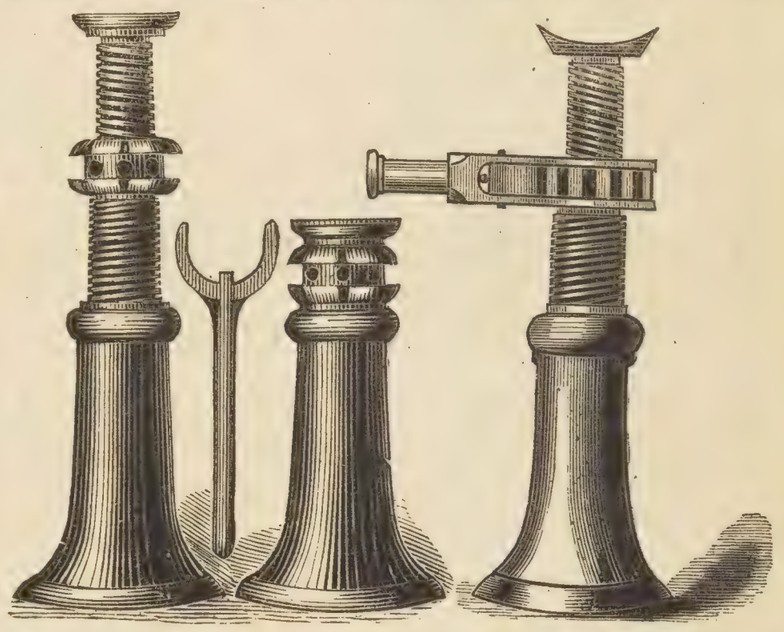

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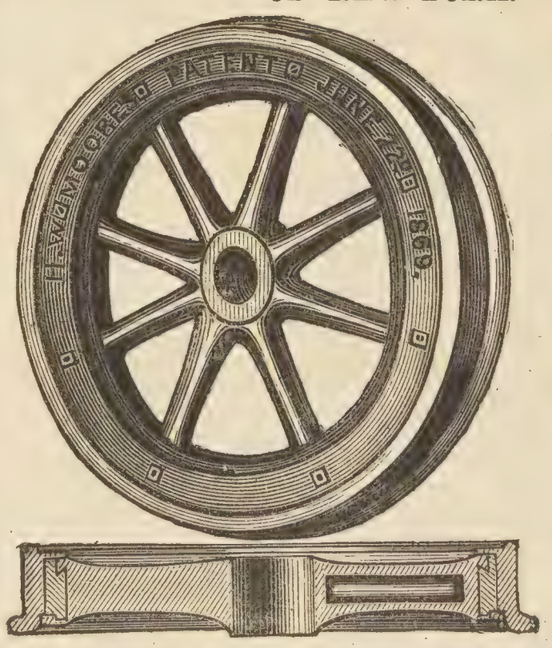

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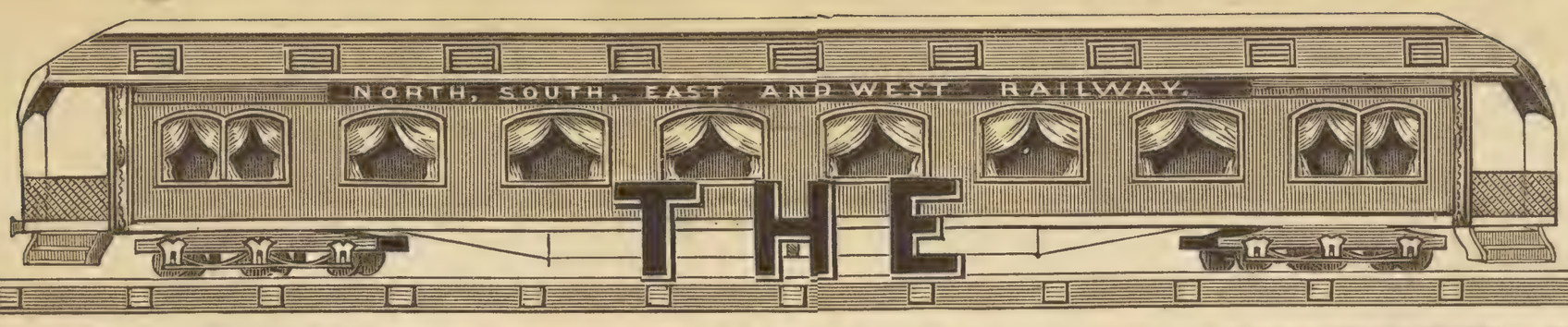

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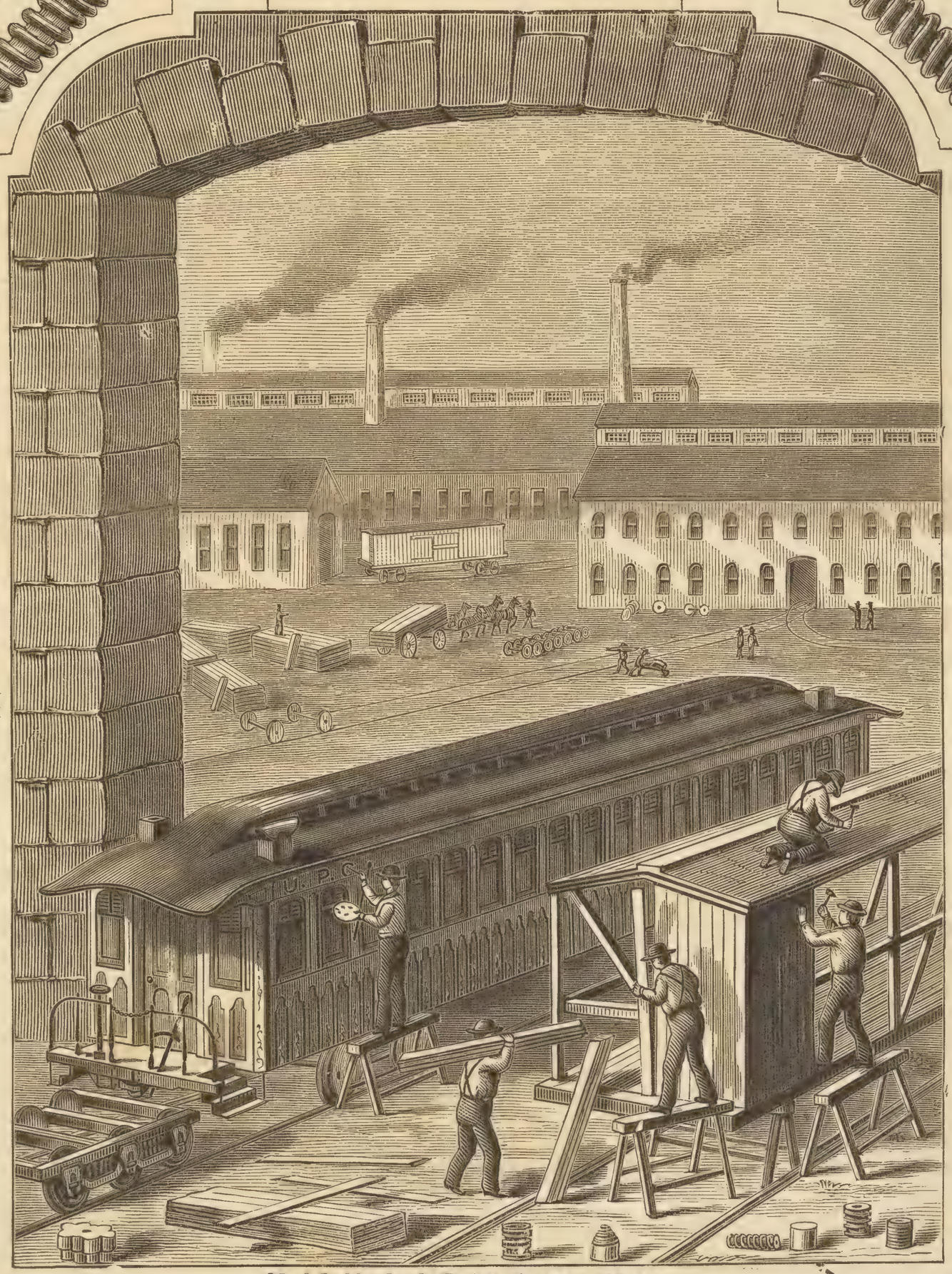
Devoted to the Interests of Railway Rolling Stock.

Vol. V. FEBRUARY, 1874. No. 2.



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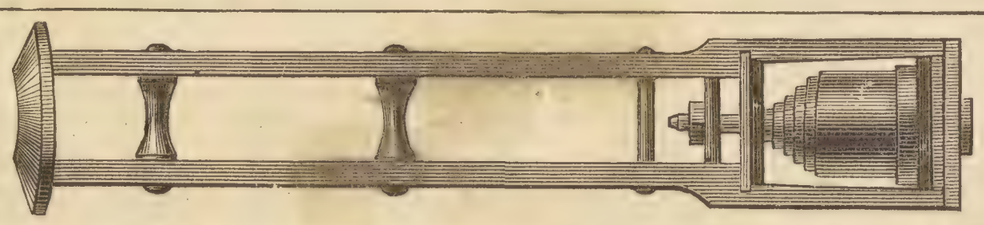

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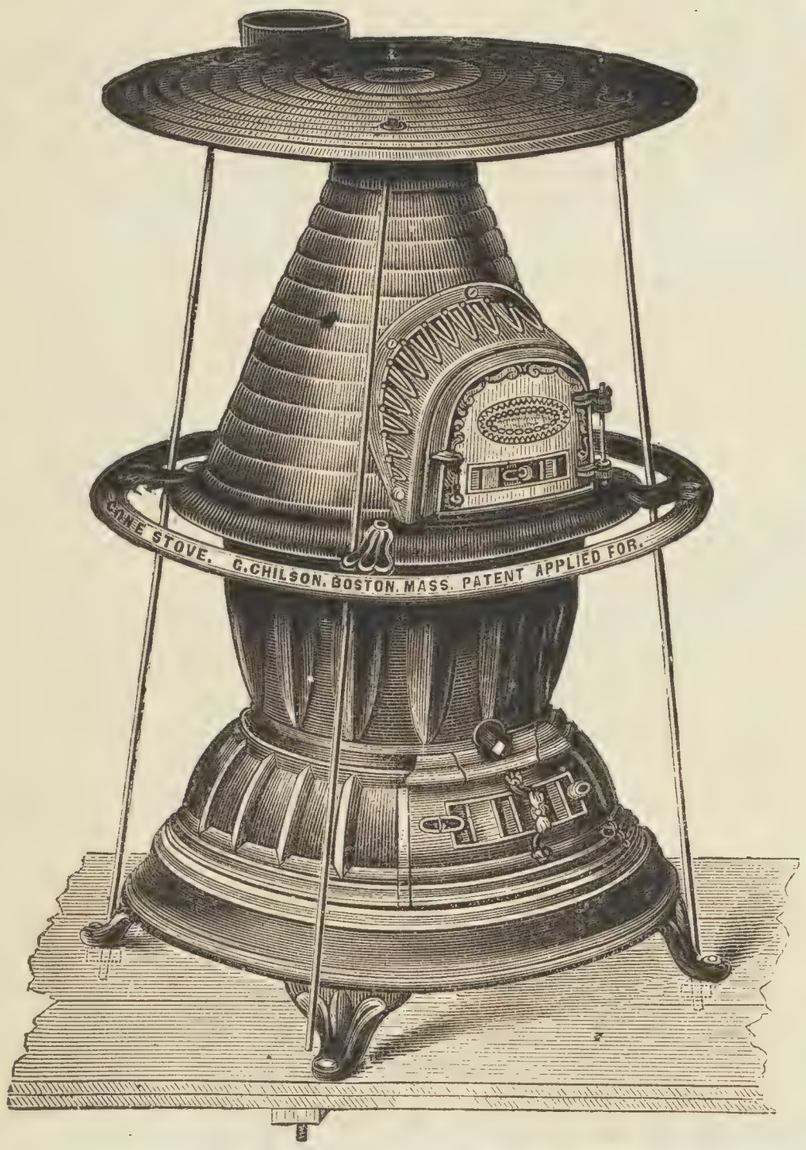

I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

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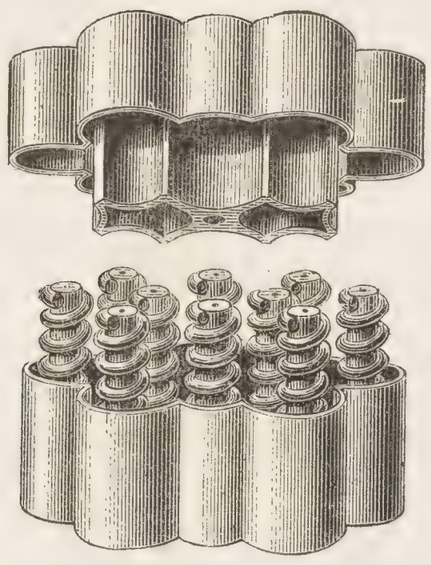

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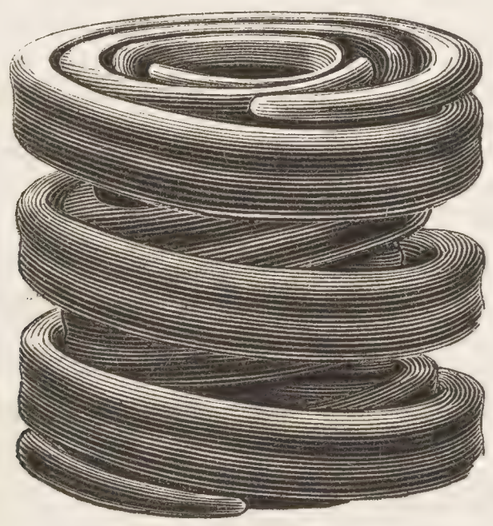

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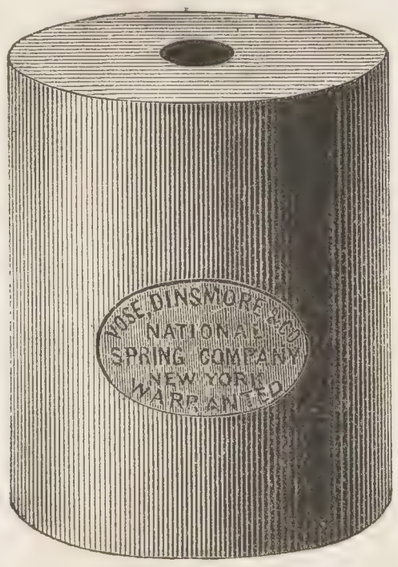

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Hitchcock Car Ventilator.

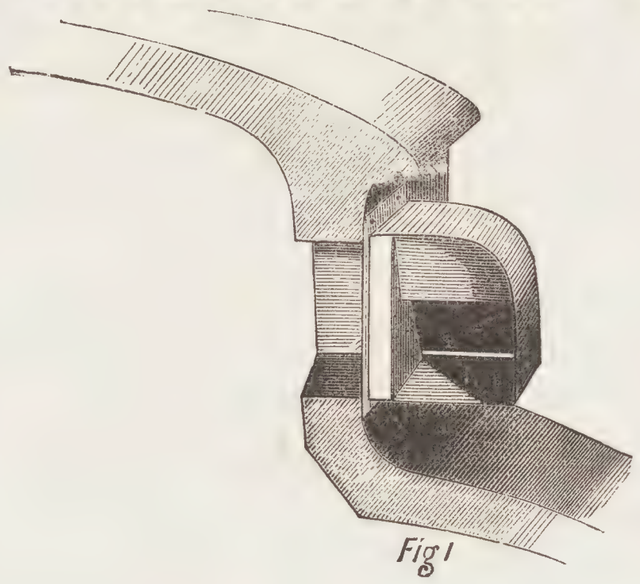
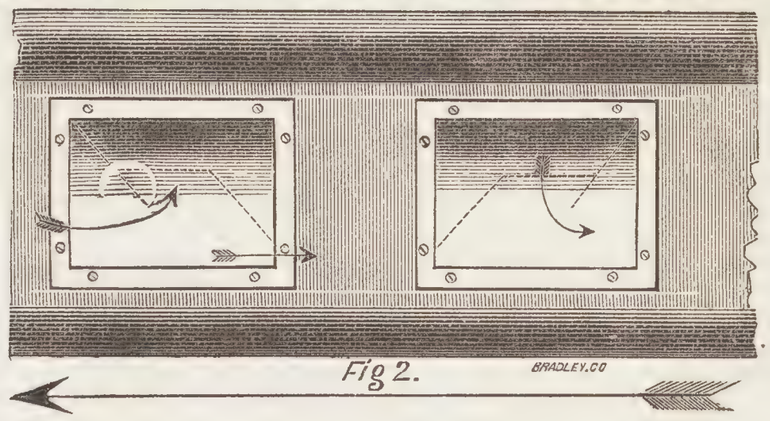


Fig 1



THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

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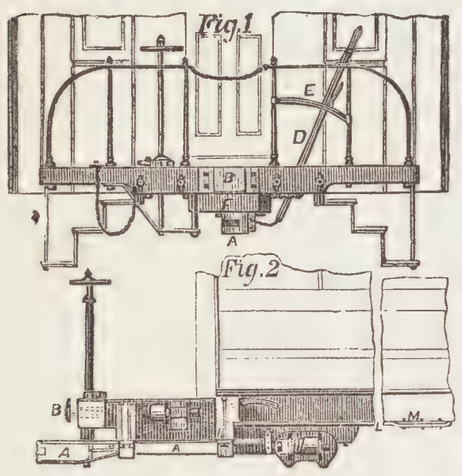

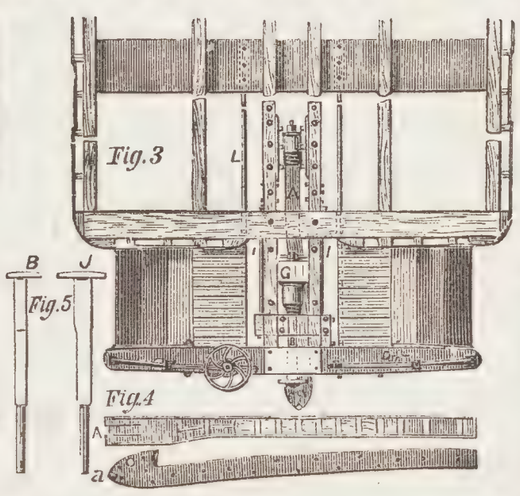

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Send for Illustrated Pamphlet, and call and see working models. E. MILLER, Patentee.

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied: and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

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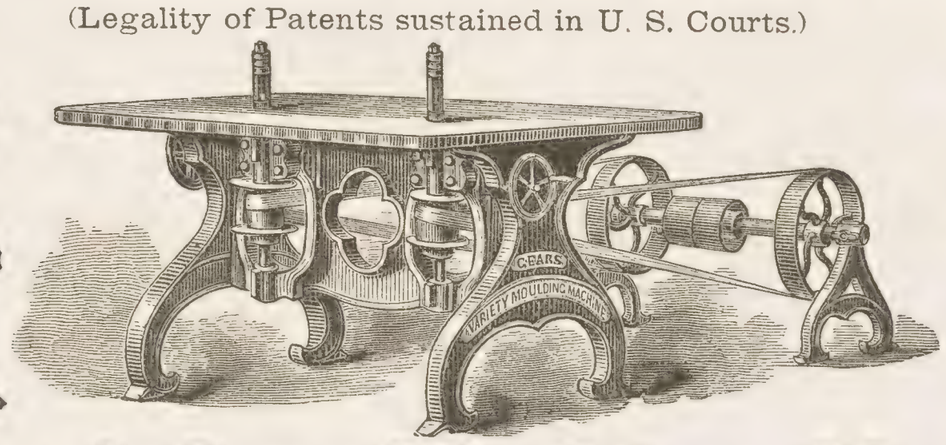

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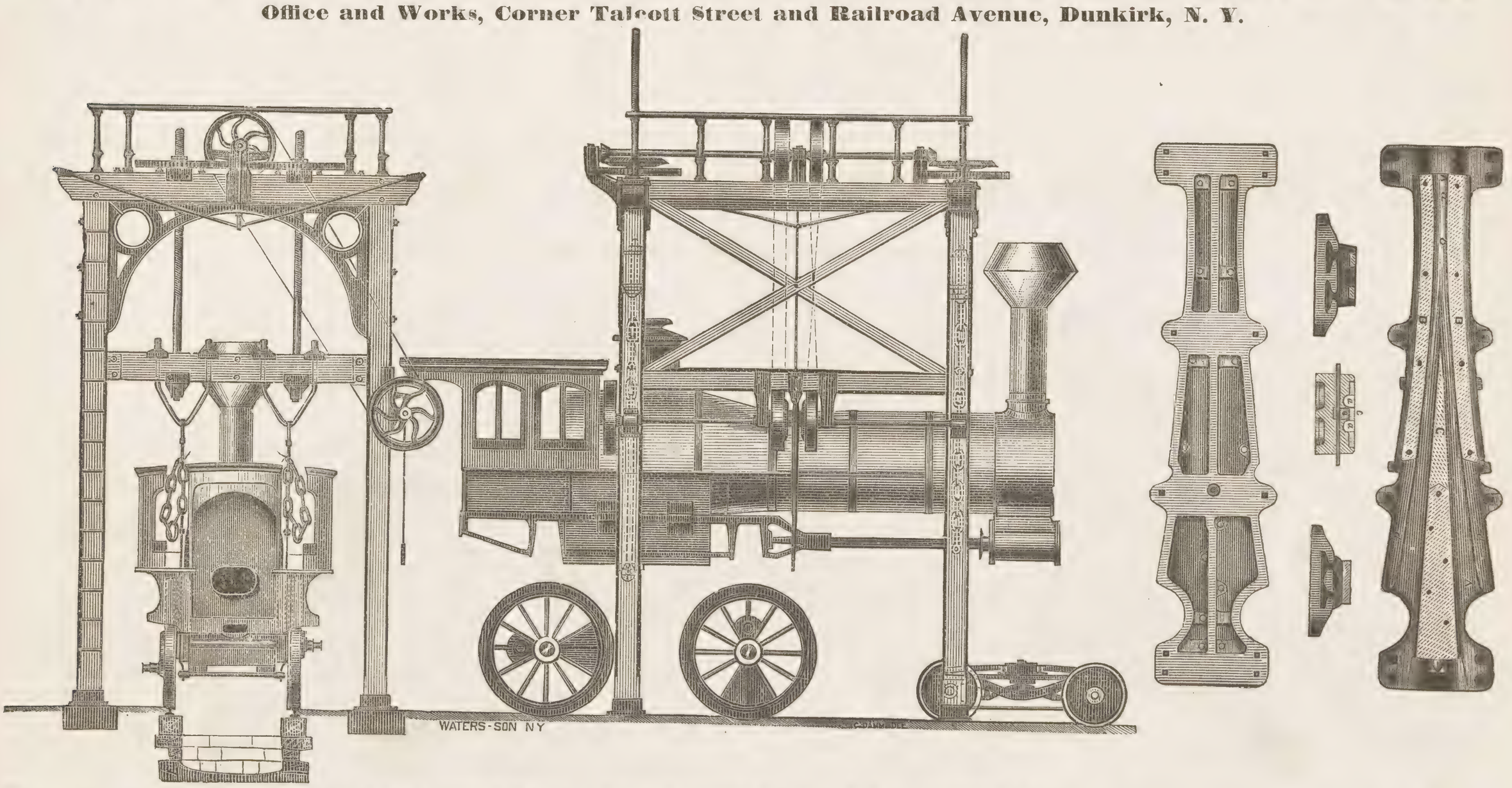

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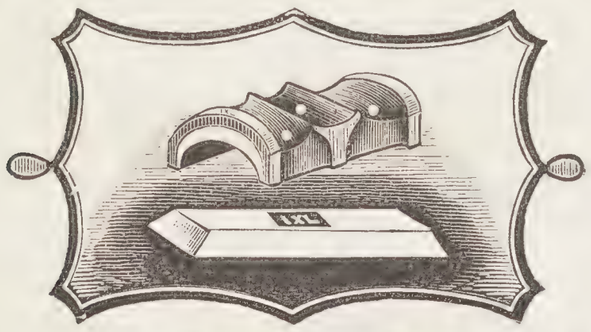

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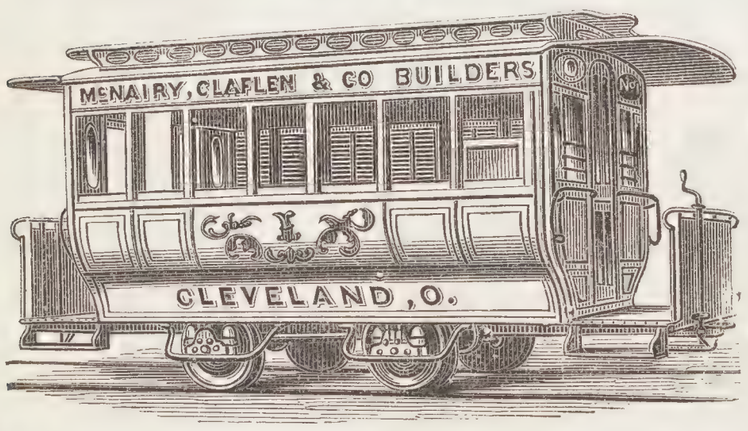

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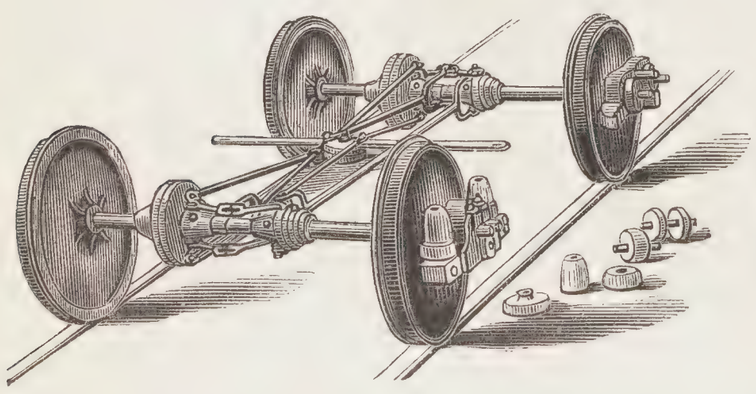

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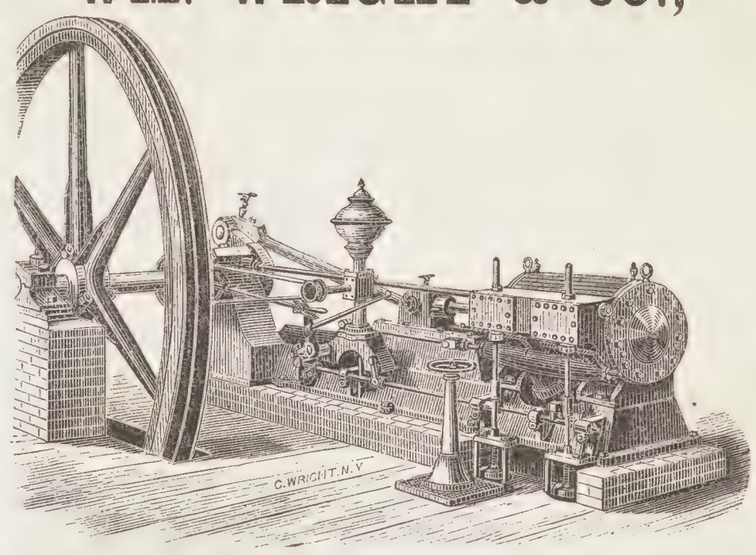

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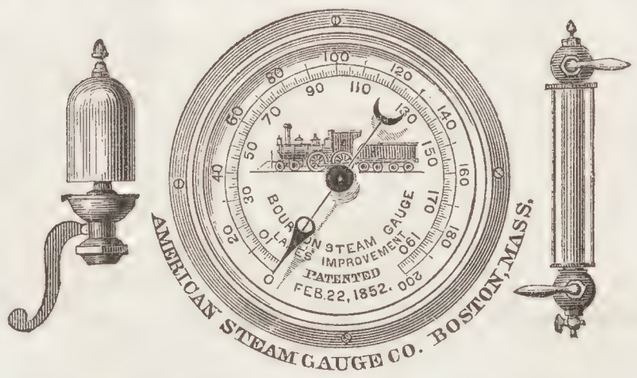

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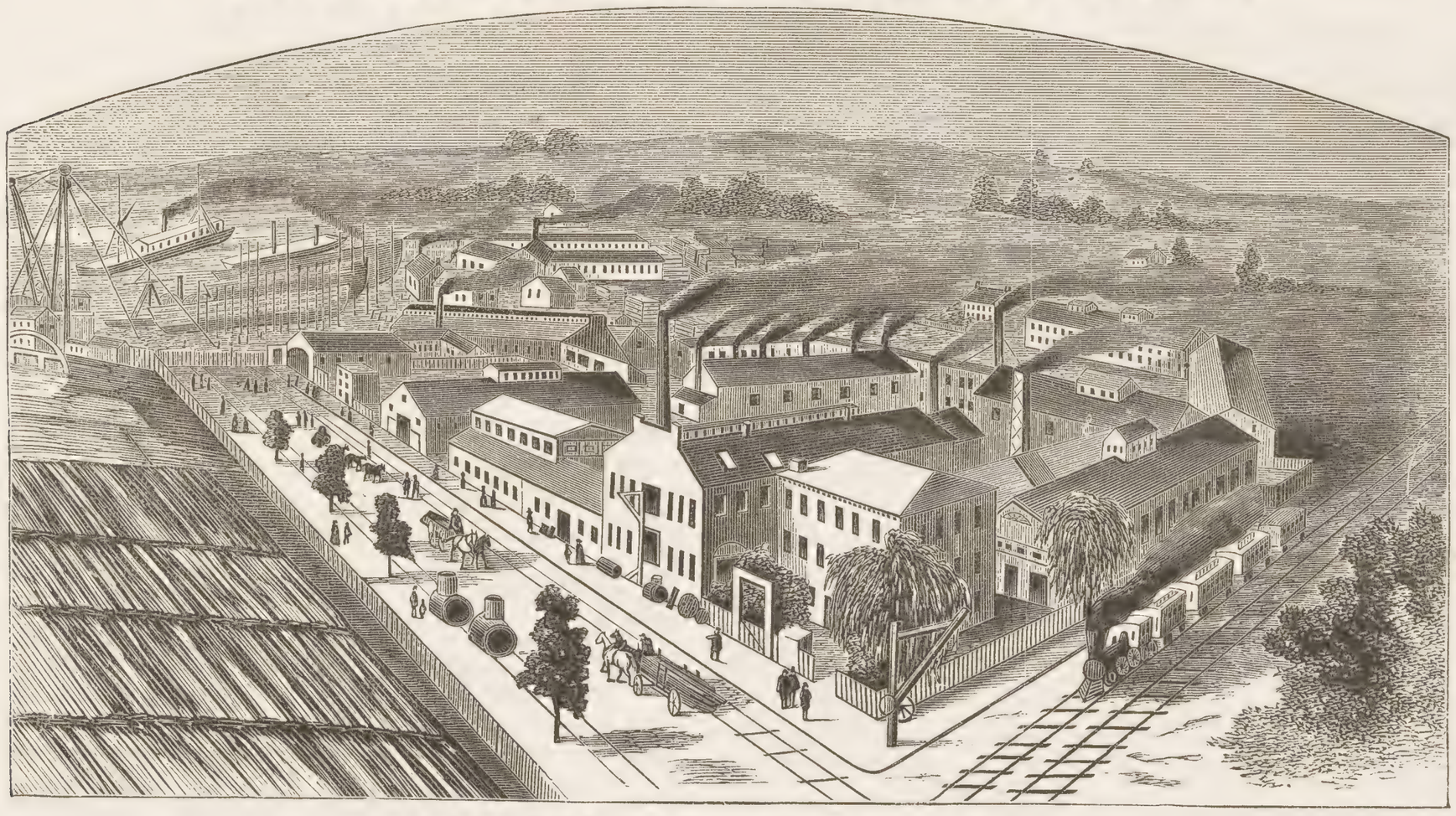

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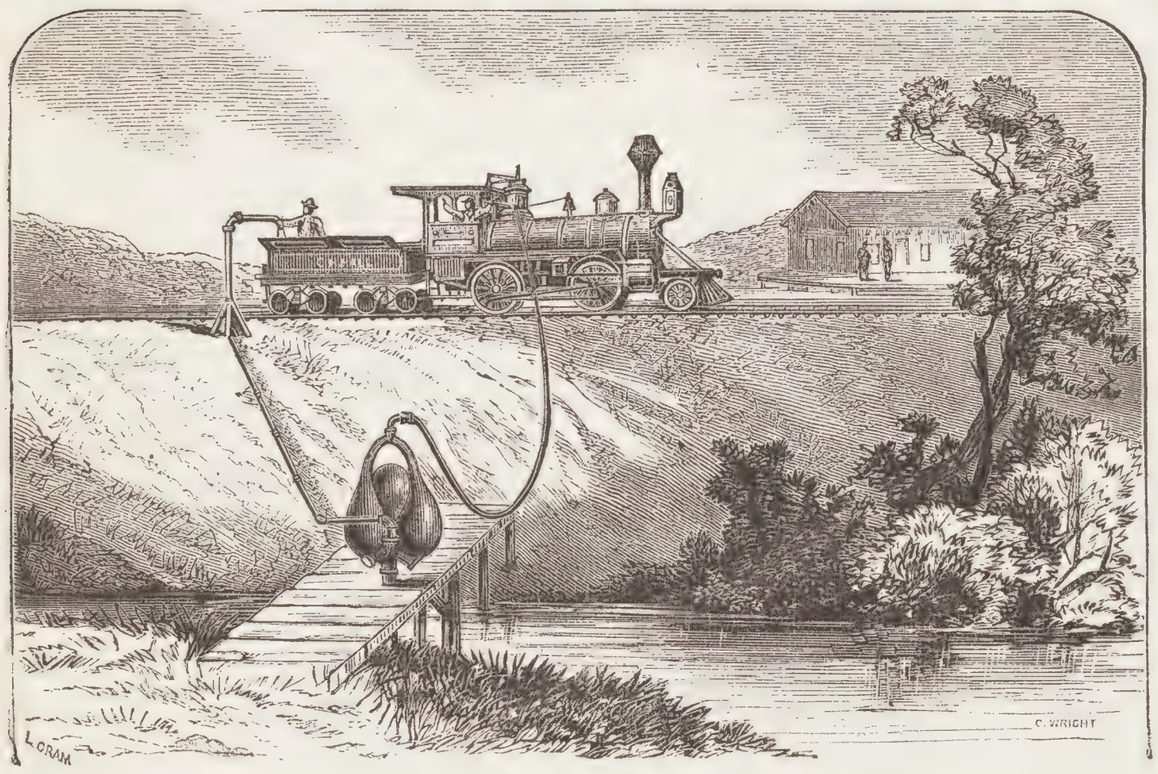

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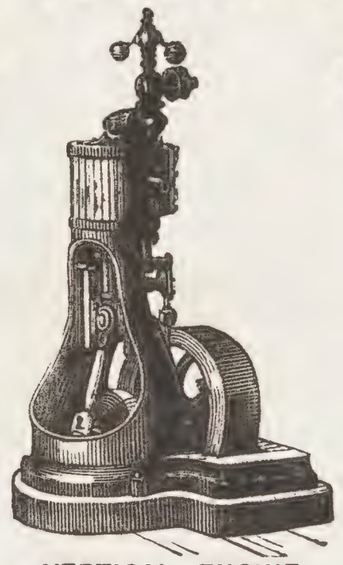

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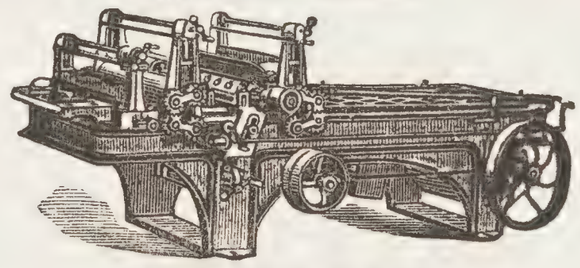

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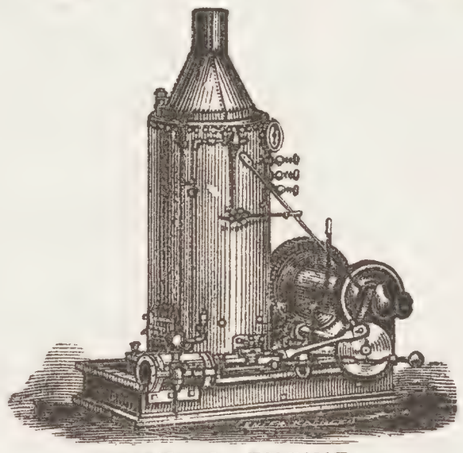

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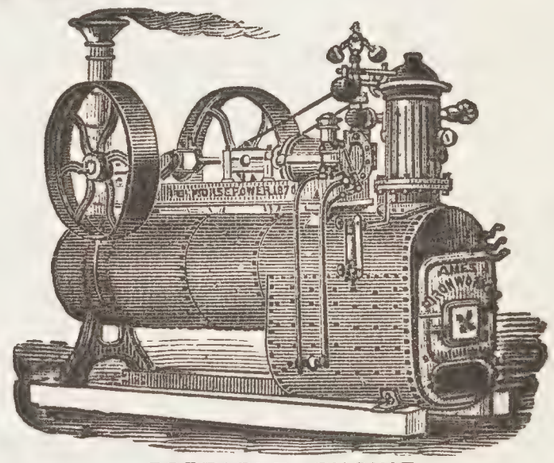

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FEBRUARY, 1874

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Narrow-Gauge in Georgia.

A CORRESPONDENT of the New-York *Tribune* writes as follows in relation to the narrow gauge road in course of construction between Columbus and Rome:

"A narrow-gauge railway is to connect Columbus with Rome, Ga., the great iron centre, of which the whole length when completed will be 130 miles, and of which a considerable portion is now in running order. It is estimated that there will be a saving of cost on its construction and equipment of from 33 to 40 per cent, while its running expenses will be reduced in the same ratio. It is a three-foot gauge only, and the cars project 2½ feet over the rails at each side. They are roomy and pleasant. In fact, unless the difference were known beforehand, one would not remark any thing extraordinary or different from the usual cars in any respect. The running was very smooth, indeed, on the day on which I took my ride, and we went at the rate of about 12 miles an hour, it being an excursion-train, and in no haste. The president of the road, T. E. Blanchard, is very sanguine of its success. The city of Columbus has already subscribed $250,000 in its bonds, and is thinking of adding $50,000 more.

"The South can not spare enough capital from her agricultural and manufacturing enterprises to build up and support expensive railroads, but these cheap ones are just the things to open communication and build up her cities. This road passes through or near several thriving towns, such as Lagrange, Franklin, Carrollton, Buchanan, and Cedartown, and runs through a region rich in its mineral and agricultural productions, much of it now remote from market and railroad facilities. This narrow-gauge, shortly after leaving Columbus, rises gradually all the time, until at a little more than 20 miles distance it reaches its highest point, on a mountain-top some thousand feet above the lower level. Yet the grades are so easy that your ascent or descent is scarcely perceptible, and unaccompanied by any risk. Skillful engineering has lessened the expense of the cuttings, and I learn that the comparative cost per mile is much lower than the average expense of similar work. Altogether, the success of the novel experiment is even greater thus far than its most sanguine friends anticipated, both as to cost and running expenses. When it is extended further, the profits will increase in a rapid ratio, as it will open to market much produce now sent by roundabout ways, and facilitate travel between intermediate points. Its passenger tariff is but two and a half cents per mile.

"What Columbus is doing in cotton, Rome is doing in iron. It may not be generally known that this small Georgia town now sells iron to the North at the rate of $14,000 per day, and that there is a large and constantly increasing manufacture in her foundries of car-wheels, axles, and other iron-work; that nails are also largely manufactured there, as well as pig iron. The marvel is—and a strong commentary it is on the carelessness of the Southern people—that such rich mines of coal and iron, lying close together, as the South possesses should have been so long left unused. It has been literally burying the talents in the ground; but they have been dug up at last. The people of Georgia and Alabama are getting wide awake; and if Northern or foreign capital can not be procured to develop these resources rapidly, they will do it as surely though more slowly themselves, even as they have done at Columbus, Rome, Birmingham, and near Montgomery, and are about doing in Mobile, which is moving in the matter of establishing a cotton factory by steam-power. Columbus annually receives about 60,000 bales of cotton, but ought to get double that quantity. She has been damaged by the multiplicity of railroads, diverting cotton to other centres, without benefiting either the producers or the smaller centres to which it is taken."

An English View of American Railway Traveling.

MR. ROBERT W. EDIS, an intelligent English architect, writes as follows in regard to his traveling experience in this country:

"No one who has not been in America can thoroughly understand or appreciate the comfort and luxury of these palace-cars, in which, whether by night or day, the traveler may journey for days together without the misery and cramped-up feeling in our own railway cars; a comfortable seat by day, with plenty of room for legs and knees, and a luxurious bed by night, entirely shut off from your neighbor, with good attendance, lavatories, and other conveniences, all tend to make traveling in the States, where great distances have to be got over frequently and rapidly, comfortable, not to say as luxurious and safe as human ingenuity can make it. It may not be out of place to mention that no expense is spared in the construction or fitting up of these cars, the cost of which often varies from $15,000 to $25,000, and that, built as they are in the most strong and substantial manner, and attached invariably to the end of the train, the minimum amount of risk is thereby incurred in case of 'telescoping' or 'colliding' in the case of a long journey. Not only in this comfort of traveling, but in the universally adopted system of baggage checking, by which endless trouble and annoyance is saved to travelers, may we in England learn a useful lesson; but while railway directors here are content to allow their servants to labor ten or twelve hours at a stretch *per diem*, on work requiring not only constant hard bodily labor, but continual mental anxiety in 'blocking,' 'signaling,' and 'switching,' etc., we can hardly expect to be free from those pleasant but exciting incidents in railway traveling which too often terminate fatally, or, as frequently is the case, maim and wound, either bodily or mentally, for life; for which some poor, wretched, overworked signalman or under servant is sought to be made responsible, while the real workers of the evil, the directors and heads of departments, seem to value the safety and comfort of the public as little as they recognize the mental and bodily labor of their servants, and for which they pay the minimum amount of wages. I can imagine the horror and dismay with which an English railway director would look upon the comfortable seats, the luxurious fitting up, the pleasant heating apparatus, the general good system of lighting, the lavatories, etc., and the iced-water tanks attached to the palace-cars of America and Canada, not to mention the comfortable beds and night accommodation which make traveling in the States almost a pleasure, instead of a nuisance and a trouble, as it invariably is in this country; or the dismay with which they would accept or adopt the aids to safety in the case of accident in the shape of Miller's platforms, Westinghouse brakes, and get-at-able cord communications. This is a digression, brought about by a comparison of recent traveling in the old and new countries, for which I pray the pardon of my readers."

The Star Mining and Manufacturing Company.

THIS company was organized during the past year for the manufacture of railway-cars, castings, forgings, and general wood-work. Its works are located at Henderson, Kentucky, on the Ohio River, a few miles from Green River, and on the line of the St. Louis and South-eastern Railway, running from St. Louis to Nashville, via Evansville, Indiana. The company announce that they are now ready to receive and execute orders, and that their facilities are such as to enable them to give satisfaction in every particular. As the four feet nine and five feet gauges terminate at this point, cars can be shipped north or south on their own wheels, and thus save considerable in cost of transportation. The operations of the company will be confined for the present mainly to the construction of freight-cars of every description, which will be turned out, as nearly as possible, in complete running order; and should the purchaser desire it, they can in most cases be loaded home. Hard woods of the finest and most durable quality are procured from the forests in the immediate vicinity, also other kinds of desirable timber used in car constru tion. The company announce that when their customers desire it, all lumber used will be subjected to a seasoning process of very great value, and which makes the car much lighter and more durable than when made of ordinary timber. The framing and other parts of the vehicle stand as firm and close after having performed good service as when first put together. The cost of applying the process is, of course, an extra charge. The company are also prepared to fit out collieries with miners' wagons, made to any pattern or design. The officers of the company are: Hon. Henry F. Turner, president; S. B. Vance, vice-president; F. W. Reutlinger, secretary; C. G. Freeman, general manager, and W. H. H. Price, master car-builder.

Narrow-Gauge Railways.

THE *American Manufacturer's Journal*, of Philadelphia, compiles the following list of narrow-gauge roads, portions of which are already built and in operation :

NAME.	Miles built.	Total length.
Denver and Rio Grande	156	870
Cairo and St. Louis	92	150
Utah Northern	70	160
Kansas Central	65	560
Arkansas Central	64	150
Colorado Central (N. G. Division)	62	237
North and South of Georgia	35	130
Montrose	27	27
Ripley	26	36
At Johnston (Private)	25	25
Cherokee, Alabama	23	45
Iowa, Eastern	20	183
Milwaukee and Des Moines	20	300
American Fork (Utah)	18	22
Pioche (Nevada)	18	18
Central Valley	12	12
East-Broadtop	12	30
Mineral Range, Michigan	12½	100
Wasatch and Jordan Valley	12	16
Pittsburg and Castle Shannon	8	8
Bell's Gap	8½	40
Peekskill Valley	7	7
Summit County, Utah	8½	30
Tuskegee	5½	30
Louisville, Harrod's Creek, and Westport	5	28
Painesville and Youngstown	12	65
Baltimore, Swan Lake, and Towsontown	6½	6½
Peachbottom	5	60
Bingham Cañon and Salt Lake	20	20
Ceredo Mineral, W. Va	12	20
Cheraw and Salisbury	11	80
Lawrence and Evergreen	5	5
Echo and Coalville, Utah	9	9
Natchez, Jackson, and Columbus	6	260
Galena and Southern Wisconsin	30	150
	928½	3889½

The following roads promise to have completed additional mileage by January 1, 1874.

Cairo and St. Louis	52
Des Moines and Minnesota	17
Parker's Landing and Karns City	10
	1007½

All the above roads are in the United States, and with one or two exceptions, are of the exact 3-foot gauge, which in this country has been accepted as the standard narrow gauge. To these may be properly added the narrow-gauge railways in active progress in the Canadas and other British possessions of North-America.

NAME.	Miles built.	Total length.
Toronto, Grey, and Bruce	199	200
Toronto and Nipissing	87	218
New-Brunswick	70	170
Prince Edward's Island	80	203
	436	791

Summing up, we have a total mileage of narrow-gauge railway built in this country of

	Miles built.	Total length.
United States Roads	1007½	3889½
Canada Roads	436	791
	1443½	4680½

In addition to these roads in actual operation, the same paper gives a list of a large number of others, projected or under construction, among which are the following :

NAME.	Under construction.	Total. length.
Florida, Memphis, and Columbia	120	600
Lexington Lake and Gulf	170	170
Wyandotte, Kansas City, and Northwestern	50	250
Cairo and Tennessee River (under construction in Duck River Valley, Ala.)	75	100
Nashville and Vicksburg	26	470
Bainbridge, Cuthbert, and Columbus	20	140
California Central	150	465
Des Moines and Sioux City	20	180
Salt Lake, Sevier Valley, and Pioche	25	300
Washington, St. Louis, and Cincinnati	65	950
St. Louis and Western	100	315

The extent to which the narrow-gauge system is being introduced in this country, as indicated by the above schedules, and the large number of projected roads which have made little or no progress beyond mere organization, will in due time afford the necessary data for determining with some degree of accuracy the comparative advantages of the narrow and standard gauges. It has been maintained by the advocates of cheap transportation, that the roads of the North-west, with scarcely an exception, have been built with a capacity from five to ten times greater than their traffic demands, and that the interest on the excess of cost is a burden which weighs heavily on the commerce of that section. If this excess can be avoided by the adoption of a gauge that will reduce the cost of construction and equipment, without a corresponding reduction of carrying capacity, it is not too late to profit by it, although it is a matter of regret that the discovery was not made twenty or thirty years ago.

The narrow-gauge system must, in its practical results, accomplish something more of a saving in cost of road-bed and rolling-stock than a *slice* corresponding to the difference in gauge cut out of the centre. There must be greater maximum strength, a smaller proportion of dead-weight, greater flexibility or capacity of adaptation to the inequalities of surface and sharp curving, by which much expensive earthwork, cuttings, tunnels, and bridges may be avoided. If, as is stated in the Denver and Rio Grande Railway report, the contents of 16 standard gauge cars, on their arrival at Denver, can be transferred to 20 of the narrow-gauge, with a saving of 76 tons in dead-weight, and if this is a fair criterion of the relative capacities of the two classes of cars, something more is accomplished by the narrow-gauge system than a mere saving in proportion to the slice out of the centre. We are aware, however, that there are a great many counter-arguments both from a theoretical and practical stand-point, urged by the opponents of the system, which can not even be glanced at in a brief paragraph. That narrow-gauge tracks will ever be made available for great thoroughfares of traffic, is not probable; but that they are well suited to peculiar localities, and for developing new sections of country, will no doubt be demonstrated in a very few years by actual facts and figures so as to be beyond farther controversy.

Locomotive Building in England.

PROFESSOR THURSTON gives, in the *Scientific American*, the following description of the locomotive-building establishment of the London and North-western Railway Company, at Crewe. "We spent a day there, seeing more that was novel, and a greater display of ingenuity, than we had ever seen outside the United States in a single manufactory. The Superintendent for a long time was Mr. Ramsbottom, one of the ablest locomotive engineers living, and to him is due the credit of planning this great establishment, and for the majority of the many ingenious departures from and improvements upon standard practice, as seen elsewhere. Six thousand men are employed here, and a town of 22,000 inhabitants has been built up about the works.

"One hundred and fifty locomotives are built per year, and nearly two thousand are kept in repair. Immense quantities of steel are made at these works, and converted into rails, tires, boilers, and running parts of locomotives. Even the bricks for the new building in course of erection are made by an excellent machine built at Rugby, and are baked on the grounds in the annular Hoffman kiln. The steel works contain four converters, of ten tons capacity each. The large and well-planned, finely lighted foundry, fitted with hydraulic cranes and steam travelers, is a model of its kind. The iron from a number of puddling-furnaces, and the steel from the Bessemer works, are worked in a rolling-mill in which the large plate-rolls are driven by the well-known Ramsbottom reversing engine, or are forged in the smith-shop, adjoining, by the curious but effective Ramsbottom steam-hammer. In this machine, the work lies upon an anvil which simply supports it, while powerful steam pistons drive against it simultaneously, from both sides and horizontally, great masses of iron which run upon tracks supported at the proper height above the floor. The heating furnaces are Siemens' regenerative gas-furnaces, the most economical known; yet even these are on so large a scale as to require two hundred tons of coal per day.

"In the machine-shops, we noticed that eccentrics were all bushed with white metal, and we were particularly interested in the style of connecting rod ends.

"They are all made solid, without strap, gib, or key, and bushed with white metal. No provision is made for taking up wear. When worn and beginning to shake, the bushings are taken out and recast. This is only found necessary at long intervals. Dome tops are struck up, and the seats of all boiler mountings are of wrought-iron. The boilers are usually four feet in diameter and the iron ⅜ of an inch thick. Steam is carried at 120 to 130 pounds. Engine-frames are of 1½ inches plate, cut out, as in all European shops, straightened, and then ground smooth by a grindstone revolving horizontally in a tank containing water. All wheels are of wrought-iron. Piston rings are of the Ramsbottom style, small rings sprung into grooves in the piston, and seem to give full satisfaction. Our forward trucks are never used, their small wheels being looked upon with great distrust. English and continental builders prefer a single pair of larger wheels. The solid bar Stephenson link is used, a decided improvement upon the strap link universally used in the United States.

"Both injectors and feed pumps are fitted to all engines. The express-engines of this road are driven at higher speed, and are claimed to make better time than those of any other road in the kingdom. They are remarkable for the great size of their, usually, single pair of drivers. Six and a half feet is the usual size, seven and a half is not uncommon, and eight feet diameter has been reached in the one example of the engine Cornwall, which is still kept at work. This engine shakes badly and has large bills for repairs. The favorite design is now, as with us, two pairs of coupled wheels for express-engines, but with drivers six and a half feet diameter. Freight-engines are given five feet six inches wheels. This whole establishment, with its fine buildings, excellent plant, and peculiar designs of machinery, and its excellent work, should be carefully inspected by every American engineer visiting Great Britain."

Temperance Among Railroad-Men.

THERE is hardly any virtue which possesses greater advantages for all classes of men than temperance. But to railroad-men it seems to hold out stronger inducements than to almost any other class. Passing by other advantages for the present, there are two in particular to which special attention is invited :

1. The pecuniary advantage. The great proportion of railroad-men receive such salaries as will only enable them to live comfortably and lay up any thing when they practice careful economy. Now, drinking is a habit which involves great expense. Let us figure a little. Suppose a railroad-man takes only one ten-cent drink a day. That makes $36.50 during the year. But every man who drinks must "stand treat" to other drinkers, so that it is safe to multiply the above sum by three, which makes the nice little aggregate of $109.50. That sum at ten per cent interest will double itself in less than ten years. So that the pecuniary advantage of temperance is not "to be sneezed at" by railroad-men.

2. The advantage of promotion. A great many intelligent and experienced railroad-men wonder frequently why they are not promoted. Some of them work for the same company a great many years, and still never receive any advancement, while others, with far less experience and intelligence, are promoted over their heads. In a great many cases, there need be no mystery about the matter, for these very men stand in

the way of their own promotion by reason of their unfortunate habit of drinking. Although this habit may never have resulted in any injury to life or property heretofore, their superiors are afraid to put such men in more responsible places, because, in the great majority of cases, it is unsafe to trust any man who drinks. The drinking man is sure to be drunk, sooner or later, and he is liable to be drunk just at the wrong time and in the wrong place. Railroad-men are responsible for the lives and property of more people than any other class of public servants, and hence it is specially incumbent on them to be temperate, so that they may never forget this responsibility. Furthermore, the railroad-man who drinks not only prepares a snare for his own feet in the way of disgrace and degradation, but his example serves as a snare to entrap others.

It is just announced in a circular issued by the superintendent of the Grand Trunk Railway in Canada, that over 1400 men employed on that road have recently signed a total-abstinence pledge, and the Governor-General of Canada has written a letter highly commending the movement. It can not be doubted that the number of railroad accidents would be greatly reduced if all railroad-men were strictly temperate.—*Railway Employé.*

An improved packing for steam-engines, pumps, etc., is composed of fibrous strands into which melted paraffine, stearine, or other lubricant, with a suitable powdered substance, is introduced during the plaiting of the strands, in order that the fibres be thoroughly impregnated. The fibrous material is hemp. The braid at or near the point where the different strands are interlocked passes through an opening in a plate, when the strands are condensed and the braid rendered uniform in thickness.

The New-York Elevated Railroad.

This road, (sometimes called the Greenwich street Elevated Railroad) is now in successful operation from the Battery to Thirty-fourth street, a distance of about four miles, and constitutes the only practical solution of the "rapid transit" problem that has yet been attained. The engraving represents a portion of the structure as it appears near its northern terminus, this part being a recent extension of the line, and containing some improvements in the style of the supporting columns designed to increase their strength. The track was completed to Thirtieth street about three year ago, by the parties who first projected the undertaking. The cars were to be propelled by means of wire-rope cables worked by stationary engines, but this method proved to be impracticable and was abandoned. The road was considered a failure, mechanically and financially, and was subsequently sold under foreclosure. A new company was organized, under whose auspices light four-wheeled dummy engines were placed upon the track, and which have worked so well that the business of the road has steadily increased until 70,000 passengers are transported over it per month. The present equipment consists of four engines and ten cars, but it will shortly be increased by two additional engines. Two cars are run to a train, each weighing about 11,000 lbs. and seating 48 passengers, the weight of the train including engine being only 312 lbs. to each passenger. The cars and engines, as well as sundry improvements in the roadway-structure, were designed by Mr. W. D. Wyman, the superintendent of the line. The most noticeable feature of the cars is the depression between the trucks, which brings the weight very near the track. The cars are also drawn from the trucks instead of from the platforms. The advantages of these features are obvious, in view of the peculiar nature of the service required. A more particular description and better illustration of the cars may be found in the Car-Builder for September, 1872.

The elevation of the track is from 14 to 18 feet above the ground, according to the requirements of grade. This elevation is, of course, suggestive of unpleasant consequences in case of accident, but so great is the vigilance exercised in providing all possible safeguards, that no loss of life or injury to any one has thus far occurred, although upward of 80 trains now run over the track daily. The road is a success and daily increasing in popularity. Although imperfect in many respects, and inadequate to meet the "rapid transit" demands of a vast population, it is, nevertheless, a hopeful prophecy of the future. It affords a contrast sufficiently striking between rapid and comfortable locomotion in steam-cars along our streets, and the uncomfortable and snail-paced horse-cars "of the period," to insure one thing at least, and that is, that the reform already inaugurated will not die out or travel backward. For the engraving and some of the items of information embodied in this article we are indebted to the *Railroad Gazette.*

THE NEW-YORK ELEVATED RAILROAD.

An experimental test of the capacity of the Loughridge car-brake was recently made on the Sandusky division of the Baltimore and Ohio Railroad. The train consisted of four cars and engine, and made a run of about eight miles at an average speed of thirty miles an hour, making six stops, each within a distance of 400 feet, on an ill-conditioned and frosty track.

The new car-shop of the New-York and New-Haven Railroad Company, at New-Haven, Ct., is now wholly completed, and the workmen have taken possession of their new quarters. In the east end of the building, a second story, 20x80 feet, has been put up which is to be used as a pattern-room.

The Standard Axle and Journal-Box.

THE committee of the Master Car-Builders' Association on these subjects have issued the following circular, to which the attention of railroad managers throughout the country is invited. The object of the circular is to secure the adoption of the standard axle and journal-box by all roads in the construction of new work, and in this way bring about uniformity in future.

DEAR SIR: The development of the railroad system of this country, and especially the increase of the number and variety of "through" cars, has made the want of uniformity of those parts of such cars which are most subject to wear and breakage, and which, therefore, require frequent repairs, so serious an evil that the Master Car-Builders' Association determined, at their meeting in 1872, to make an effort to obviate the difficulty as far as possible, and, with that end in view, appointed a committee to investigate the subject carefully, and report to the next annual convention of the association. This committee was appointed, and made a report, which was fully discussed at the last convention, held in Boston; and, after careful consideration, an axle of the dimensions shown in the following engraving was recommended for a universal standard for freight and passenger-cars, for 4 feet 8½ inch gauge roads.

The committee were then instructed to prepare a circular and address it to the managers of the various railroads in the country, setting forth the action of the association, in recommending a standard for car-axles, with a request that *authority be given for its adoption* for all new cars built in future, for the roads under the control of the persons to whom the circular is sent.

From the engraving it will be seen that the dimensions adopted for the standard axle are somewhat larger than those of axles in ordinary use. The object aimed at in adopting these dimensions was, first, to get a larger journal and bearing than that ordinarily used; and second, to eliminate, as far as practicable, all danger of accident from the breakage of axles.

It is a well-established fact that their friction "*is proportional to the pressure, and is independent of the area of the surfaces in contact,*" and therefore the friction will not be increased by enlarging the size of the bearings. "There is, however, a limit to the exactness of this law, which has an important bearing on its application to the proportion of car-journals. The law, as stated, is true, so long as the pressure is not sufficiently intense to force out the oil or grease from between the surfaces. When this limit is reached, the friction increases more rapidly than in simple proportion to the pressure." It is well known that the friction of journals is often twice as great with imperfect lubrication as it is if they are well oiled. That the oil is often, at least, partially forced out, was shown by some very interesting experiments made on the New-York and Harlem Railroad. Mr. Garey, the master car-builder of that line, placed 3¼ x 5½ inch, 3½ x 6½, and 3¾ x 7 inch journals under the same car. He then cast the bearings for these journals, of the same metal, and weighed them each carefully before putting them under the car. After the car had run 28,000 miles, he took them out and weighed them again. He found the smallest journal had lost, in that time, from wear, five pounds in weight; the next in size, three pounds; and the largest, only two and one quarter pounds; showing that the lubrication of the largest journal was much the most perfect, and the wear, consequently, the least, and that the surface of the smaller bearings was not large enough to prevent the grease from being, at least partially, forced out from between the surfaces. This experiment, besides the experience of other members of the association, with journals larger than those in common use, it is thought, show conclusively the advantage of increasing the size of these parts of car-axles, and that such an increase will result in greater economy and prevent much annoyance and delay from "hot boxes."

It is certain that by increasing the size of axles, with the same material, they will have greater strength, and their liability to break will, therefore, be diminished, and the danger of accident from this cause will be very much diminished, if not entirely eliminated.

The following are some of the railroad companies which have already authorized the adoption of the standard car-axle for all new cars to be built in future for their lines, together with car companies who have ordered patterns:

New-York Central,
Boston and Albany,
Rome, Watertown, and Ogdensburg,
Taunton Machine Company,
Hudson River,
Norwich and Worcester,
Housatonic,
Gilbert Bush & Company,
New-York and Harlem,
Boston & Providence,
Wason Manufacturing Company,
Osgood Bradley.

After deciding upon a standard for car axles at the meeting in Boston, the Master Car-Builders' Association authorized a committee to determine upon a pattern for an oil-box, journal-bearing and jaws for the standard axle. That committee, after careful deliberation, have agreed upon a plan for these parts, and have made arrangements with parties in Albany, N. Y., to furnish metal patterns for them. These patterns are all made to gauges and templets, to insure their uniformity, and can be procured by addressing Mr. Joseph Jones, master car-builder of the New-York Central Railroad, at West-Albany, N. Y.

It is thought that, by this action, the association has made it practicable to introduce uniformity in those parts which wear most, and require renewal oftenest. In order to give *authority* to their action, it is, however, necessary that the *managers of railroads should sanction* what the master car-builders have done. They, therefore, trust that you will authorize the adoption of the standards they have fixed upon, and thus further the only object they have had in view—that of securing for these parts of cars which require most repairs, more uniformity, the want of which is now so great an obstacle in the way of forwarding freight promptly, and such a prolific cause of delay and expense. Should you take any action regarding this matter, the committee would be glad to learn your conclusions.

F. D. ADAMS,
Boston and Albany R.R., Springfield, Mass.,
D. HOIT,
Toledo, Wabash, and Western R.R.,
J. KIRBY,
Lake Shore and Mich. Southern R.R.
Committee.

Heating, Lighting, and Ventilation.

THE committee of the Master Car-Builders' Association in charge of these subjects as they apply to passenger-cars, have issued the following circular, to which the attention of railroad men is invited:

To Master Car-Builders and others having charge of Railway Passenger-Cars:

GENTLEMEN: The undersigned, a committee appointed by the Master Car-Builders' Association, at its sixth annual convention at St. Louis, and continued at its seventh annual convention at Boston, to investigate the subjects of heating, ventilating, and lighting railway passenger-cars, beg leave to submit to you the following questions, for the purpose of eliciting information to be reported by the committee at the eighth annual convention at Cincinnati.

The committee hope that your interest in these important subjects, and a desire to promote the usefulness of the association, will insure an early and satisfactory reply to each question:

1st. What kind of heating apparatus do you recommend for heating passenger-cars? Why do you recommend it?

2d. What kind of fuel do you recommend? Why do you recommend it?

3d. Do you recommend that the heating apparatus be put underneath the car, or inside of it? Why do you recommend that position?

4th. Do you recommend a system of heating and ventilation combined? Why do you or do you not recommend it?

5th. How many cubic feet of fresh air do you think should be supplied to each passenger per minute, in order to keep the air in a car healthful?

6th. In your opinion, what is the best way to admit this quantity of air into a car?

7th. By what method would you remove the impure air from cars in winter, when only common stoves or heaters are used?

8th. By what method in summer?

9th. Do you know of any means by which cars can be heated and ventilated in winter and cooled and ventilated in summer?

10th. What do you recommend for lighting cars? Why do you recommend it?

11th. In your opinion, what is the best way to protect cars from damage by fire, in case of accident to train?

12th. How are the cars on your road heated?

13th. How are the cars on your road ventilated?

14th. How are the cars on your road lighted?

Any other information, bearing upon the subject, not suggested by the above questions, will be cheerfully received by the committee. Address replies to the chairman.

W. E. CHAMBERLAIN, *Chairman*,
B. and A. R.R., Allston, Mass.
V. D. PERRY, H. P. and F. R.R.
A. GLEASON, O. C. and N. R.R.
Committee.

How Railroads are Built.

MR. WILLIAM BOND, of New-York City, was recently appointed president of the St. Joseph and Denver City Railroad Company, and under instructions from the stock and bond holders, has made a careful investigation of the affairs of the road, and submitted the results in a report to the board of directors. From this report, it appears that 227 miles of the road have been completed, or nearly the entire distance from St. Joseph to Ft. Kearney, and that portions of it have been in operation since April, 1871. The amount of paid-up capital is $1400! According to the cash statement, the money received from various sources for purposes of construction, since the organization of the company, is as follows:

14 shares, capital stock....	$1,400	realized	$1,400
St. Joseph City bonds.....	500,000	"	357,649
Sundry county bonds.....	400,000	"	241,300
Road bonds.....6,755,000		"	4,665,493
Town bonds.....	29,000	"	19,250
Kansas State donation....	164,528	"	164,528
	$7,849,928		$5,449,620

It will be noticed that the difference between the face of the bonds and the net proceeds realized is $2,400,308, or a fraction over 30½ per cent. These net proceeds, together with additional outstanding liabilities, amounting to $781,034, and making in all $6,230,654, were expended in building, equipping, and running the road, and in paying bond coupons falling due. The total liabilities of the company, including $4,000,000 capital stock, are stated to be $12,800,737, and the actual available resources are estimated as follows:

Land grant of 500,000 acres.....	$2,000,000
Road equipment.....	258,575
227 miles of road, costing.....	5,200,000
	$7,458,575

The loss in operating the road from April, 1871, to October, 1873, including taxes paid and expenses in New-York, is stated to be $169,303. The land is expected to increase somewhat in value with the growth of population, and the completion of the St. Joseph bridge, opening the eastern connections of the road, is expected to improve the traffic, so it can be operated without loss. The directors are informed, however, that the company will not have sufficient resources either to meet its floating liabilities, pay its past-due coupons, or provide for those to mature, for a long period to come; and that the proposition of the previous board of directors to create new mortgages for the purpose of funding existing liabilities, and providing means for extending the road and procuring additional equipment, is considered wholly impracticable. A thorough reorganization, and temporary lease of the road to the Hannibal and St. Joseph Railroad Company, is recommended as the best means of protecting the property, and placing it ultimately on a paying basis.

Railway Accidents in England.

A CORRESPONDENT writing from England to one of our daily papers, remark as follows in regard to the increasing frequency of accidents on English roads:

"Quite a panic has sprung up among railway travelers. For the last five or six weeks—ever since the Wigan disaster, in fact—there has been scarcely a day without an accident of some kind. August is a very busy tourist month, and the railways generally break down about this time of year from press of work. This

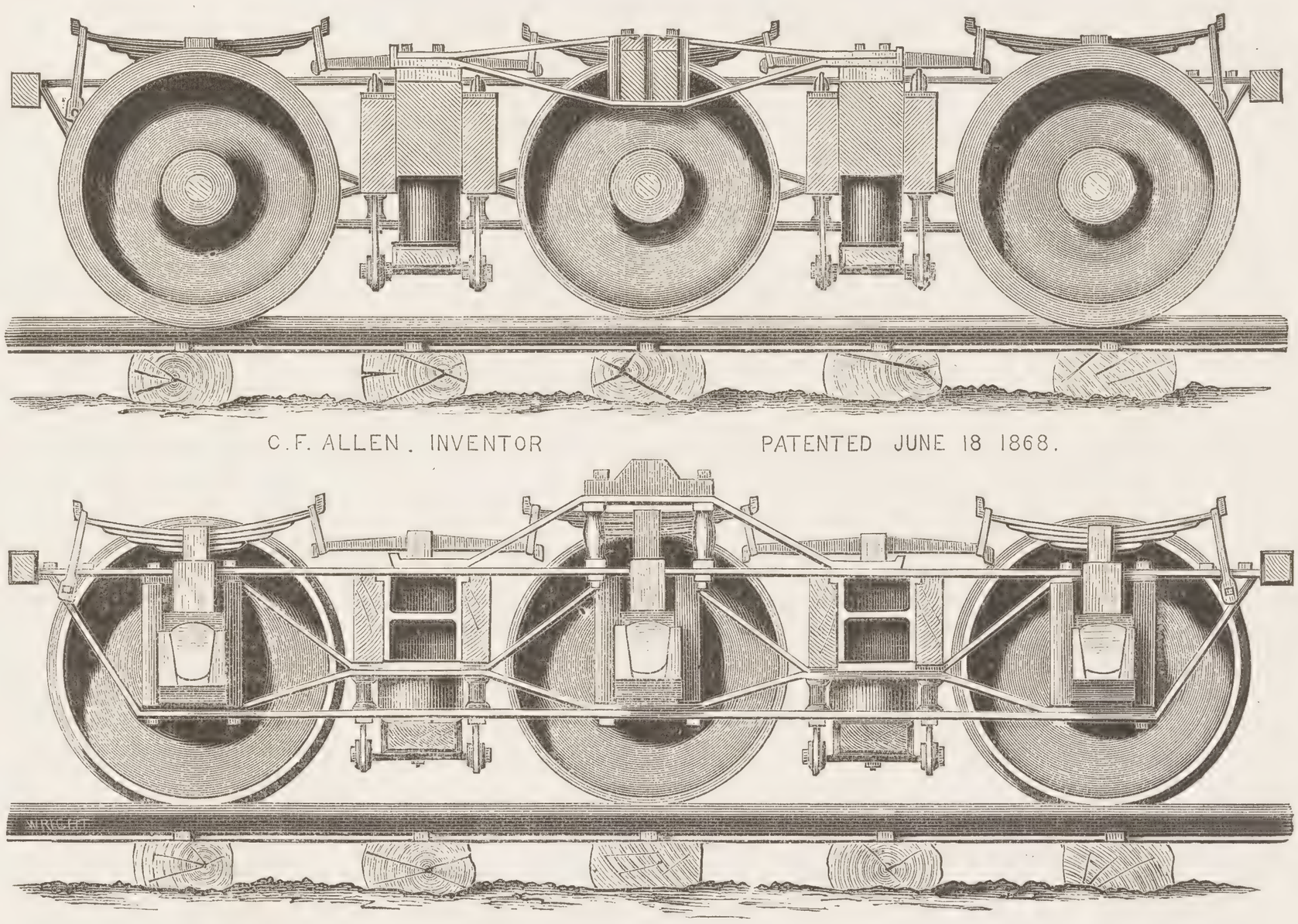
is their harvest, and they try to reap it with their ordinary staff. The consequence is, that trains are overcrowded, there are delays at the stations, and engine-drivers have to make up by extra speed for the time which is thus lost. The whole body of railway officials seem to get into a feverish, reckless state of mind, and there is less caution than usual at a season when it should be increased. The rush of accidents follows as a matter of course. It was hoped that when August was over there would be fewer accidents; but instead of diminishing, they are becoming more frequent. In August, it was bad enough to have one every other day or so, but now there are usually two a day. At this rate, in November, we may expect one every half-hour. Now it is a collision; now it is a train broken in two by defective facing-points, one part going on one set of rails and the other on the other line, till the couplings break and the carriages crash over on each other; now it is cattle on the line. Within a fortnight, there have been three accidents—one a very bad one—from cattle on the line, but the railway companies are quite above providing engines with cow-catchers. They are content with fences, which a fat bullock can take at a run, and bullocks are not exactly as agile as hogs. Pneumatic brakes is another American device which they will do well to borrow. As it is, the brake-power is badly deficient, and hence engine-drivers bear down on each other in full sight, without being able to stop before the collision happens. The multiplication of facing-points is owing to the desire to avoid laying down fresh lines of rail at important junctions. The main line is turned into a series of good yards, with shunting constantly going on, and expresses rushing through without stopping. A controversy has arisen as to whether the rate of speed on railways ought not to be reduced. Ordinary trains go at a rate of thirty or forty miles an hour, and expresses at the rate of forty-five or fifty miles an hour, but often at sixty or seventy for a spurt. Of course, if the choice lay between going safely and at a moderate speed, or going very fast with a good chance of being killed, most Englishmen would unhesitatingly pronounce for the latter. But they have not yet been convinced that express traveling is necessarily dangerous if proper precautions are adopted."

A VERY full and comprehensive table of railroad statistics, published in the December number of the *Railway Monitor*, and embracing about 850 companies, presents the following aggregate footings: Total mileage, 71,564, exclusive of second track and sidings; locomotives of all kinds, 14,223; passenger-train cars, including baggage, express, mail, and smoking-cars, 13,725; freight-train cars, of all sorts, 338,427; total capital stock, $2,072,251,954, or about $28,956 per mile; total floating and funded debt, $1,999,741,597, or $27,957 per mile; and the total cost of railroads and equipments, $3,728,416,958, or about $52,099 per mile.

Allen's Centre-Bearing, Swing-Beam, Six-Wheel Truck.

WE briefly alluded to this truck in our notice of Mr. Allen's four and eight-wheel trucks in our last issue. The engravings we now give represent an exterior side view of it, and also a longitudinal sectional view, showing the various parts and details of its construction so clearly that they will be readily understood by car-builders.

The frame of the truck, with the exception of the transoms, swing-beams, spring-planks, and end-sticks, is of iron, and of such strength and rigidity as to keep the axles parallel to each other and square with the frame, but allowing the wheels at the same time to run easily over curves by reason of the peculiar arrangement of the main centre-bearing and its connection with the two swing-beams. This arrangement consists of a bridge or frame, a portion of which is shown in section in the upper drawing, and which rests upon the swing-beams, the centre-plate sustaining the car-body being immediately over, but not bearing exclusively upon, the middle axle, thus distributing the weight equally upon the journals of the three axles. The side-bearings, as shown in the lower cut, are outside the wheels and directly over the journal-boxes of the middle axle, at which point the body of the car is supported when the inequalities of road-bed or track render such support necessary. In the cuts, the middle wheels are represented without flanges, the effect of which is to make the curving still easier. The use of flanges on these wheels, however, is discretionary with builders or users. The truck has been tested without them, we are informed, with the most satisfactory results.



This six-wheel truck, in its construction, is a modification of the principles embodied in Mr. Allen's four and eight-wheel trucks, and is adapted to heavy passenger-coaches. It combines the requisites of lightness, strength, durability, and economy, and has been in use since 1866 on the Chicago, Burlington, and Quincy Railroad, having been applied to the first Pullman palace-cars built at the Aurora shops. For further information in regard to it, communications may be addressed to A. I. Ambler, P. O. Box 1644, New-York City.

AN apparatus for warming street-cars is now being introduced on some of our city lines, by Mr. John Whiteford, of Chicago. It consists of a small furnace placed under the car and attached to the centre of the flooring. The fuel is deodorized coal-oil, supplied from a reservoir under the hood, or just above the driver's head. The furnace is inclosed in a casing of galvanized iron, forming an air-chamber, from which the warmed air is admitted into the car through a register some three feet long, extending lengthwise in the centre of the passage-way. The supply of oil is regulated by cocks to suit the temperature required. The apparatus is simple and inexpensive, and the consumption of oil does not exceed a gallon or a gallon and a half in twenty-four hours. It is now being tried on the Third and Fourth Avenue, and the Harlem and Morrisania lines.

A trial was recently made in Brooklyn of the "fireless locomotive" plan of propelling street-cars. A car was fitted up with the engine, and a tank charged with steam from a stationary boiler, the pressure in the tank at starting being 142 pounds. With this supply of steam, the car ran 35 minutes, and traveled a distance of 4½ miles, the pressure at the end of the trip being reduced to 22 pounds. The engines had two cylinders of 5 inches diameter and 7 inches stroke, and made about 147 revolutions per minute. The tank was 9 feet long and 37 inches diameter, with a steam dome 12 x 24 inches. The car contained no passengers except a small number who witnessed the experiment. This method is said to be in operation on one of the street lines in New-Orleans with very satisfactory results.

AMONG the projects for cheapening transportation between the East and the West is a scheme for a bridge across Detroit River, at Detroit, upon the feasibility of which a board of engineers has been appointed by the State of Michigan to make a report. Last winter, transportation was obstructed two months by ice at the Detroit ferry, causing thousands of cars to accumulate at that point, and millions of bushels of grain to be locked up at Chicago. The only serious opposition to a bridge is made by those interested in lake navigation.

THE Niagara suspension bridge was opened for traffic eighteen years ago last August, and the first retimbering of it has just been completed. The work began the 7th of April last, and has been under the general supervision of George McKenzie, master-mechanic, with William Gardner and William McFaul as foremen. Mr. McKenzie so managed the work that at no time has there been any detention of trains or teams, and no accidents of any magnitude have occurred. About 300,000 feet of seasoned timber have been used in the retimbering process, and about $10,000 have been paid for labor. The most difficult part of the job has been to rebuild the girders under the railway-track. The last stroke of the work was done November 28th, and the bridge stands now as good as new in its wood-work.

About Check-Chains.

To the Editor of The National Car-Builder:

Dear Sir: One evidence of progressive improvement in the construction of railway rolling-stock is the fact that ten years ago such things as check-chains were rarely seen on passenger-cars, and still more rarely or not at all on freight-cars, while to-day they may be seen on most of our leading lines of road. Their utility as safeguards has become so generally recognized that their absence from cars in any case is apt to be regarded as false economy or a blind adherence to old usage. The only practical point to be settled in regard to them would seem to be the way in which they should be attached. As to the best method of doing this, there is much diversity of opinion, as is shown by the report of the committee of the Master-Mechanics' Association on the subject. Some recommend the use of $\frac{7}{8}$ round iron for engine and tender-truck chains, while for passenger-cars, $\frac{3}{4}$ iron is considered sufficient, and $\frac{5}{8}$ iron for freight-cars. Why there should be such a difference in the size of the iron required for these various trucks, is not very apparent, as the strain in the case of a passenger and tender-truck, taking the weight into consideration, would not, in case of derailment, be materially different. In view of the jeopardy of life and limb, the check-chains of a passenger-car should certainly be as strong as those of a tender; and as regards freight-cars, nothing less than $\frac{3}{4}$ iron should be used, and when properly attached, such chains seldom break in case of broken wheels or derailment.

In cases of breakage, probably nine times out of ten, the break occurs at the neck of the eye-bolt by which the chain is attached to the truck, the form of which is represented in Fig. 1. Instead of making the bolt

Fig. 1.

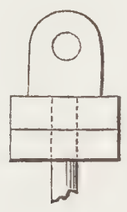


Fig. 2.

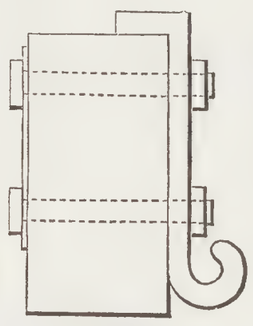


Fig. 3.

in this way, the neck should be dispensed with, and the bolt made straight from the shoulder, as shown in Fig. 2, which gives greater strength and resistance to strain. Fig. 3 illustrates the method much in use for attaching the chains to the car-body, and will be readily understood by car-builders. Much of the prejudice against the use of check-chains arises from their liability to give way under severe strain, and such prejudice can only be removed by making them stronger at points where they are weak.

There is a very good plan for fastening the hook to the side-sills where they are double, but as such sills are not generally used by car-builders, the plan can only be adopted to a limited extent. It consists of a strap loop introduced between the two pieces forming the sill, with the ends turned over on top about an inch each way, the whole being secured by two $\frac{5}{8}$ bolts passing through straps and sill. An eye is thus formed underneath the sill to receive the chain-hook. In passing through the hospital-yard of one of our prominent railways a few days since, we noticed several styles of check-chains, one of which had an eye-bolt with a wood screw-thread cut about half the length of it, and the bolt then turned into the sill, from which it had been pulled out whole, having first split the sill. This method of attaching chains is not likely to render them popular.

Fig. 4 illustrates the more modern and approved method of fastening them to passenger-trucks. It consists of a $\frac{7}{8}$ loop with $\frac{1}{8}$ shoulders next to the strap-washers on the outside of the wheel-timber, the two ends passing through the timber being of $\frac{3}{4}$ iron and 3 inches apart, with a $\frac{3}{16}$ x $1\frac{1}{2}$ strap-washer between the nuts and the wood, the same as on the outside between the shoulders and wood.

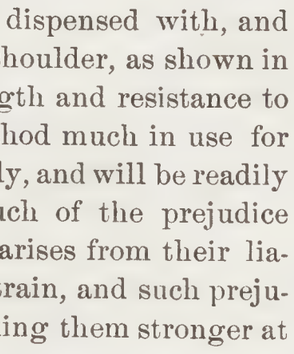


Fig. 4.

A few words in regard to the number of check-chains to a car. Of the cars that have any at all, probably one third of them have but four each. Why this number should be the limit in any case, we have never heard satisfactorily explained. Some master-mechanics seem to think that check-chains should only be applied to the four outside corners of tender-frames, thus leaving the four truck-corners nearest together to swing loose. They also propose to attach them to the forward ends only of engine-trucks. Now we would like to ask how the loose ends of these trucks, or the ends having no check-chains, are to be managed in case the engine goes off the track running backward, which is not an impossible occurrence. There have been cases where cars, with only two chains to a truck, have gone off the track and the rear truck has been turned end over end, although this would probably not have happened if there had been a key in the lower end of the king-bolt below the truck timber; but as there was no key in one of these cases, at least, the car was virtually as well off with no check-chains as with only two.

There are those who oppose the use of check-chains, because they do not happen to have any personal knowledge of trains saved from wreck by their instrumentality. The writer hereof has in mind no less than three instances, within as many weeks, of trains getting off the track, and which were kept on a line with it and saved from the ditch by means of them. Another instance occurred last winter on a Western road, in which one of the home cars equipped with 8 check-chains run over a broken rail, both trucks leaving the track and the coupling parting at each end. This car stopped after running about three times its length, with none of its wheels over 15 inches from the rail; while following it were four foreign cars with no check-chains, and when they stopped, two of them were in the ditch, the forward end of the third one part way over the bank and the other end on the rails, with the forward end of the fourth car on top of it. Ten pairs of wheels were off the track, and only two pairs of them were fit for service without going through the shop. The only damage sustained by the home car was a broken brake-rod, while an outlay of $1600 was necessary to repair the others. This shows the utility and economy of these safeguards, and it is to be hoped they will be universally adopted. Lorain.

Westinghouse Brake Improvements.

The Chicago *Railway Review* thus refers to some experiments recently made on the Chicago and Alton Railroad, for the purpose of testing some improvements which have been made in this brake:

"It would seem a misnomer to speak of any application of this now popular device as experimental; and we therefore hasten to say that the term we have used in the present instance relates to certain improvements which Mr. Westinghouse has devised, and may be said to have perfected. The Chicago and Alton Road has been using the Goodale steam-brake on two of its trains, and the ordinary hand-brake, with Creamer attachment, on the others. It has postponed the palpably foregone conclusion of introducing the Westinghouse brake until there would seem to be little left to improve upon in this admirable device. Up to a recent date, the Westinghouse brake has been under the exclusive control of the engineer; now it can be applied to the entire train by any person in any car; while the train, in case of derailment, also applies the brake to itself, adding an immense impeding force to the obstacles which it otherwise encounters. These improvements we shall not at present describe, further than to refer to the *modus operandi* of the automatic attachment. A rod connected with the working parts of the brake extends from between the cylinders, midway in the length of the car, down toward the road-bed, and a transverse rod is fastened to it, extending across the track about five inches above the surface of the rails. When, in case of derailment, either end encounters an obstacle, the motion of the centre-rod applies the brake to the entire train. The efficiency of this device was curiously exemplified when Mr. Westinghouse was here. A plank which had sprung up at a road-crossing was encountered by the rod; the brake was applied, and the train brought to rest in a few hundred feet while the locomotive was working with full steam.

"The experiments on the Chicago and Alton Road were as follows (the train being composed of six cars, including two Pullman sleepers):

"1. Running 30 miles per hour; engineer applied brake, stopping train in 475 feet.

"2. Running 30 miles per hour; applied automatic brake, from car, while engine was working at full steam; train brought to rest in 500 feet.

"3. To demonstrate the efficiency of the brake in case of the train breaking in two, at 30 miles per hour the coupling-pin of the engine was pulled out; the hose was broken apart, applying the brake to all the cars and stopping the train in 350 feet.

"We understand that Mr. Westinghouse has also introduced an improvement by which, as the brake-shoe wears, the slack is taken up and the shoe held close to the wheel.

Mileage of English and American Locomotives.

The London *Engineer* compiles a table in which, among other things, is shown the mileage of American locomotives on some of our leading lines of road, the Illinois Central, for instance, showing an annual mileage for each engine, of 29,590 miles; the Baltimore and Ohio, 27,276 miles; and the New-York Central, 25,075 miles; while the mileage of engines on the London and North-western Railway is only 15,127 miles per year, and the general average for all English roads does not probably exceed 18,000 miles. According to these comparative estimates, the quantity of work performed by American engines is considered quite unexampled and beyond all English experience in railroad operation. The *Engineer* can only account for the surprising difference by attributing the superior performance of American locomotives to our way of pushing things. It assumes that if all the engines are effective and working every day in the year, and if the average speed of passenger and freight trains together be estimated at 15 miles an hour, each engine must be at full speed about $5\frac{1}{2}$ hours out of the 24, and travel over 81 miles with a full load. But making allowance for those under repair or engaged in piloting and shunting, the daily work of an effective locomotive on the Illinois Central road is estimated at 8 hours, at full speed, and traveling a distance of 120 miles with a full load. This is considered quite extraordinary when the inferior construction of the American roads, as compared with those in England, is taken into account. It is also noted that our engines take larger loads, and earn nearly 30 per cent more than English engines, notwithstanding our rates of transportation are lower. The working cost of our roads, however, shows a balance greatly in favor of the English as nearly as it can be approximated in the tables given, ours being 34 per cent on the original value of the rolling-stock, against only 19 per cent in England, and 24 per cent of receipts against only 14 per cent in England. How much of this great difference is attributable to the inferiority of our roads, and how much to the excessive work the stock has to perform, the writer thinks it is impossible to estimate.

A Minnesota mechanic has solved a difficult problem in railroading by the invention of a snow-shovel, which clears a roadway wide enough to allow the cars to pass, takes all the snow clear down to the rails, carries it up, deposits on whichever side preferred, at a speed of from two to six miles an hour, according to the depth of snow.

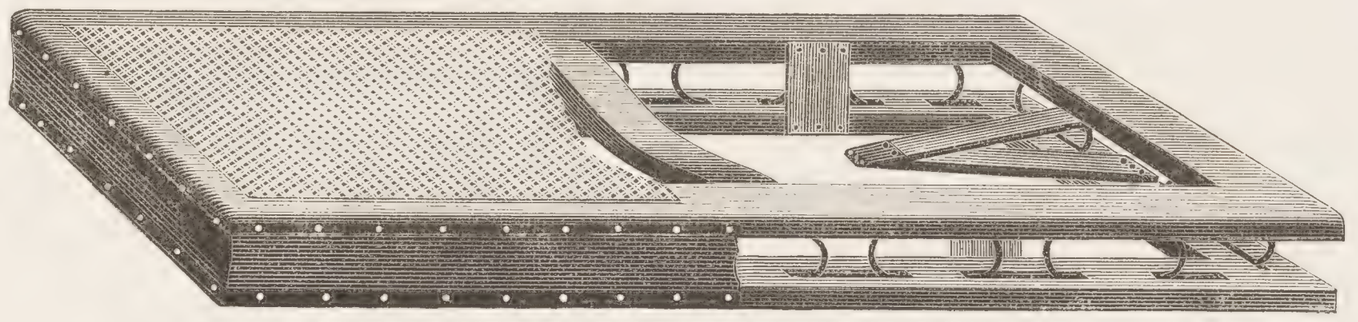
Through and Local Charges.

AN Illinois railway official, referring to the fact that corn and wheat raised in western Iowa could afford to pay a certain amount of freight, and no more, for transportation to the sea-board, and that the roads could not pay running expenses if all their business was done at the same rate at which they were carrying these Iowa products, was asked, "How is it, then, that you can afford to carry *any* freight at rates that will not pay running expenses?" "That is a point," replied the official, "that has puzzled the farmers, but I think I can explain it to you. They think we are greatly overcharging them, because we get such low rates for through-freights. Fully one half of the expenses of running a railroad are what are called 'stationary'—that is, they are the same whether the road does a large business or a small one. There are the station agents, who must be paid just as much, if only two trains pass in a day, as when twenty go by. Experience has also proved that a road is not safe, unless it is patrolled and every foot of it examined every day. It takes an engineer, a fireman, a conductor, nearly as many brakemen, and about the same amount of coal to run a train of fifteen cars as to run twenty. All of our roads have a bonded debt, the interest on which must be paid, whether they do a large business or a small one. Now we will suppose that a certain road must earn $1,000,000, during the year, in order to pay expenses, and its local business brings it in only $750,000. If it has no other business, it must either increase its local rates one third, or lose $250,000. But there is a through business that the road can get, if it will take it at half rates; if more is charged, it will either go some other way or not at all. If the business is taken, the expenses of the road will be increased, say, $100,000, but the receipts will be increased $500,000. Now the road by taking this business has made $400,000, although the half a million of through business has not paid expenses, as you will see. For had all the business been done at the rate that the through business was, the company's receipts would have been only $875,000, while its expenses were $1,100,000. So, you see, these cheap through rates not only benefit the producer, in the Far West, who is enabled by them to get his grain to market, but they also benefit the farmer in this State, because they help to pay the expense of running the roads, and in that way make it possible to have lower local rates."

A Patent Ticket-Indicator.

A NOVEL apparatus has just been patented which is intended to receive the tickets and conductors' checks of railroad passengers, indicate the destination of each traveler while he is in the car, and keep a record of all the trips made, inaccessible to any trainman, or to any one except the proper agent—presumably a representative of the General Ticket Agent, at the end of the trip. For this purpose there is fastened a box with two compartments on the side of the car above each seat, there being one compartment for each passenger. When the conductor takes up a ticket, or collects a cash fare, he punches the ticket or the check which he gives for the cash fare and slips it into the mouth of the compartment which answers to the passenger's seat. The box contains a simple apparatus which conducts this ticket to a plate inclined a little from the perpendicular, on which it rests, plainly visible through the glass face, and showing the stations from and to which the passenger is entitled to ride. After being put in, it can not be touched, and if the passenger is inclined to ride farther than he has paid, the ticket over his head will show plainly and unquestionably his proper destination. When he gets out, and a new passenger takes his seat, the entering of the latter's ticket causes the former's to drop into a lower compartment, while the one last received remains in the upper. Thus at the end of the trip, the upper compartment will have the ticket of the passenger who occupied the seat last, and the lower one the tickets of all the other passengers who have occupied the seat since the box was last opened by the person whose business it is to collect them; and the collection of tickets so made is a substitute for the conductor's report.

One lock locks all the boxes on one side of the car, by a bar which extends from end to end, and fastens all the boxes. There is to be, however, a lock at each end, so that the ticket collector, entering at either door, may unlock a lock on each side of the door and then go through the car and collect the contents of all the boxes without further difficulty.—*American Manufacturer.*



A Cane Car-Seat with Springs.

THE use of cane seats in railway cars, especially in warm climates and during the hot season in our own climate, is very desirable for obvious reasons; but the difficulty has heretofore been to give them such an elastic spring motion as to make them comfortable to the sitter. The cut illustrates a recent invention by Mr. H. B. Cobb, of Wilmington, Del., by which this difficulty seems to have been effectually overcome, and a cheap and easy cane-seat secured, with all the requisite spring motion, small liability to get out of order, easily cleaned and repaired, and admitting a free circulation of air through all its parts. The construction is so clearly shown in the drawing that little description is necessary. Elliptic steel seat-springs are placed between the upper and lower frame, where they are securely held in place by grooves above and below, in which they are inserted and protected from breakage. Wooden springs, as shown, are also placed in the ends to aid in sustaining the weight, and prevent lateral motion or rubbing against the side of the car. The seat can be used with or without upholstering. It is adapted to all classes of cars, but will be found specially serviceable for smoking and second-class steam-cars, and also for street-cars, in which the ordinary cushioned seats, from their liability to attract vermin, require frequent renovation. Some of these seats have already been put into first-class passenger-cars designed for South-American roads. They are manufactured by the proprietors, Messrs. Z. Cobb & Sons, of Chicago, who also have a branch house at Wilmington. Vose, Dinsmore & Co. are the agents in New-York.

Iron the most Valuable Metal.

THE late eloquent Edward Everett brought the usefulness and superior value of iron forcibly out in one of his public speeches, in which he compared the most useful of all metals with the most useful of all classes of society—the laboring class, the toilers, to whose hands we are indebted for every thing which has value. His words were reported thus:

"I have now in my hand a gold watch, which combines embellishment and utility in happy proportions, and is often considered a very valuable appendage to the person of a gentleman. Its hands, face, chain, and case are of beautiful gold. Its gold seals sparkle with the ruby, topaz, sapphire, emerald. I open it and find that the works, without which this elegantly furnished case would be a mere shell—those hands motionless, and those figures without meaning—are made of brass. Investigating further, and asking what the spring is made of by which all these are put in motion, I am told it is made of steel. I ask, What is steel? The reply is, it is iron which has undergone a certain process. So, then, I find the main-spring, without which the watch would be almost motionless, and its hands, figures, and embellishments but toys, is not gold (that is not sufficiently good), nor of brass (that would not do), but of iron. Iron therefore is the only precious metal, and this watch but an emblem of society. Its hands and figures, which tell the hour, resemble the master spirits of the age, to whose movements every eye is directed. Its useless but sparkling seals, sapphires, rubies, topazes, embellishments, are the aristocracy. Its works of brass are the middle class, by the increasing intelligence and power of which the master spirits of the age move; and its iron main-spring shut up in a box, always at work, but never thought of, except when it is disorderly, broken, or wants winding up, symbolizes the laboring class, which, like a main-spring, we wind up by the payment of wages, which class are shut up in obscurity, and though constantly at work, and absolutely necessary to the movement of society, as the iron main-spring is to the gold watch, are never thought of except when they require their wages, or in the same want or disorder of some kind or other."

A Novel Locomotive.

THERE has just been completed at the machine shop of Lafferty & Bros., Gloucester City, N. J., a 4-ton locomotive, designed to run on one rail. It is built for a street-railroad company in Georgia. This engine can with propriety be called a steam-velocipede, as it rests upon two wheels, one following the other. The rail or track upon which it is to run—a sample of which is laid in the yard of the builder—is styled "Prismoid, or one-track railway," and is composed of several thicknesses of plank, built up in the style of an inverted keel of a vessel, with a flat rail on the apex. Upon a trial, a speed of about twelve miles an hour was attained, and the inventor and patentee claims that the speed can be almost doubled on a lengthened track. Mr. E. Crew, of Opelika, Ga., is the inventor and patentee of both tracks and engines; and he claims that his invention demonstrates a tractive power superior to any thing in the locomotive line of equal weight. The capacity for running curves is very much greater than the two-rail system. The track upon which the trial was made contained 36 feet of lumber and 18 pounds of iron to the lineal foot, proving itself equal to a span of 20 feet, remaining firm and unyielding under the pressure of the engine as it traversed the road. The revolving flanges attached to the engine, and which run on the outside of each wheel, Mr. Crew claims, absolutely lock the rolling-stock to the prism, and obviate the necessity of so much heavy rolling-stock in light traffic at a high rate of speed. It is also claimed that a prismoidal railway built with a base of 14 inches, angles 40°, can be built at a cost of $3000 per mile. The inventor is of opinion that this engine and track is particularly adapted to the propelling of canal-boats, and will compete successfully with horse-power on canals, without necessarily interfering with the use of the latter, but he does not state in what way. The engine will shortly be shipped to its destination (Atlanta, Ga.), where it goes into operation on a street-railroad built at an elevation of 12 feet above the sidewalk.

THERE is a great rush of freight for Liverpool over the Grand Trunk Railway, so much so that all the spare sidings in the vicinity of Portland are occupied with cars waiting to be discharged. The freight is mainly from the West, and consists of pork, cheese, and breadstuffs.

The National Car-Builder,

PUBLISHED MONTHLY,

BY

VOSE, DINSMORE & CO.,

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JAMES GILLET, EDITOR.

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

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ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

The Future Demand for Cars.

THE present statistics of railway rolling-stock equipment are not sufficiently full and reliable to warrant any thing more than a very general estimate or approximation of the actual number of cars on all the roads, and it is still more difficult to form any estimate of the respective numbers of the various classes of freight-cars. A statement prepared with much care and labor, was submitted by Mr. Garey to the Master Car-Builders' Association at their last annual meeting, showing the number of eight and four-wheel cars on the standard and wide-gauge roads of the United States and Canada, on the first of June, 1872, and also the number built during the year ending on the first of June, 1873, the aggregate amounting to 340,787. This is doubtless less than the actual number by several thousands, as there were several roads from which no returns were received. The number of eight-wheel cars, as given in the last volume of Poor's Manual, and based on returns of the various roads for the fiscal and calendar years of 1872, is 304,307, exclusive of Canada. If we add to this, 58,355 four-wheel cars, which is Mr. Garey's estimate of the number at the close of the year 1871, it will make a total of 362,662 at the beginning of 1873. In addition to these estimates, we have more recent returns as shown in the table published by the *Railway Monitor*, giving the whole number of cars of every description at 352,152, exclusive of those on the Canada roads. We have no means of reconciling the differences in these several estimates. Assuming, however, that Mr. Garey's is somewhat below, and Mr. Poor's somewhat above the mark, we will compromise by a rough average, and put down the aggregate number of cars of all sorts on the United States roads at the present time, at 350,000, which, on a mileage of 71,000, would be a fraction less than 5 cars per mile. This of course does not include narrow-gauge cars, which are not sufficiently numerous to materially affect the result.

The statement of Mr. Garey embraces an estimate of the whole number of cars, irrespective of the wheel classification, built at road shops and by regular manufacturers in the United States and Canada, during the year ending on the first of June, 1873, and which is substantially as follows:

Passenger-train cars	1,501
Box-cars	17,604
Platform-cars	8,337
Gondola-cars	9,276
Stock-cars	3,867
Coal and ore-cars (4 and 8-wheel)	12,672
Miscellaneous	5,853
Total	59,110

This estimate is no doubt approximately correct, and if we classify according to the same relative proportions the 350,000 assumed to be on all the roads at this time, the result will be about as follows: Passenger-train cars, 8900; box-cars, 104,380; platform-cars, 49,240; gondola-cars, 55,160; stock-cars, 22,580; coal and ore-cars, 75,300; miscellaneous, 34,440. This classification, however, can hardly be considered a very reliable one as respects the relative numbers, as it gives only 8900 passenger-train cars, as against 13,725 by the *Railway Monitor* tables. As respects the other specified classes, we have no data by which to test their correctness, nor is it very important for the purpose of determining the quantity of new cars likely to be needed during the current year.

In regard to the above number estimated to have been built during the year ending June 1st, 1873, it is evident that a very large proportion of them were for the old roads. The new roads constructed during the same period did not probably exceed 7000 miles, and as their car equipment must from financial necessity have been comparatively light, it is safe to say that it did not amount to more than one quarter of the whole number built—that is to say, 15,000 for the new roads, and 44,000 for the old ones. How many have been built within the past eight months it is impossible to say; but in view of the almost entire suspension of work by the regular manufacturers, and the enforced economy in railway expenditure which has prevailed during the financial panic, the number of new cars constructed must have been very small indeed as compared with the number built during the corresponding period of the previous year There has doubtless been considerable reduction in general railway traffic since the first of November, but previous to that time there was no material falling off, so that it is fair to assume that the aggregate business of the old roads since the first of June would require nearly the usual quantity of new rolling-stock to replace what was worn out, unless the previous supply was excessive. In the long run, the consumption is determined by the traffic, and as long as the general traffic is maintained, there can be no excess in equipment except from transient or local causes. It is evident that every road doing a fair business has been making the best use of all its available car-stock in order to avoid expenditure for new, and as the general traffic depends chiefly upon the agricultural products of the country, and as these are not likely to diminish, the time is near at hand when a large replenishment of rolling-stock will be required by the leading lines of road.

New roads laboring under financial embarrassment, with a partially developed business, and small facilities in the way of shops and machinery, will of course add but little to their present equipment. The greatly diminished mileage of new road construction during the past year will very much lessen the demand for cars from this source, and which has heretofore been mostly supplied by the regular manufacturers. The falling off in this class of orders may be made good to a considerable extent, however, by the wants of the older roads, which have for some months past been wearing out their former stock, with no renewals, except in the way of repairs. The old companies, to be sure, have large facilities for building their own cars, but if the general business of the country should improve, as there is every prospect that it will, for a time at least, under the stimulus of increased production and an inflated currency, the capacity of the road shops may not prove equal to the amount of repairing and new construction that may be required. The increase in the number of cars built during the year ending June 1st, 1873, as shown by Mr. Garey, was nearly 25 per cent of the whole number estimated to be on the roads at the beginning of that year, and if this was a legitimate increase to meet the demands of traffic during that period, it follows that the same causes will determine the supply in future. There is then, so far as we can see, no reason why a healthy revival in the business of car-building may not be anticipated at an early day.

City Street-Transit.

THE time we trust is not far distant when our present street-car system will be superseded by something more effective and better adapted to the requirements of city transit. This will become a matter of sheer necessity resulting from the growth of local passenger traffic in our large cities. This traffic has already become so enormous in the city of New-York that the inadequacy of existing lines is painfully apparent; and it is no less obvious that so long as horse-power is relied upon as a motor, there can be no substantial improvement. Steam must sooner or later be introduced and applied in such a way as to completely revolutionize present methods; and when this is done, the surprise will be that the change was so long deferred. Among the plans that have been proposed is the attachment of a complete engine, boiler, and supply-tank, similar to the Baxter portable engine, to each car; also the use of ordinary dummies on an elevated track, as illustrated on another page of this paper; and the so-called fireless locomotive, dispensing with fire-boxes and boilers, and propelled by steam carried in a tank and supplied by a stationary generator. These several methods have been tested to such an extent as to leave little doubt as to their practical utility. The great objection to horse-cars at all seasons of the year, and especially in winter, is their slowness of movement, causing discomfort and loss of time, to say nothing of the inhumanity of compelling the jaded and overworked animals to draw loads disproportioned to their strength over snow-covered tracks, steep grades, and sharp curves. What we want is a reasonable rate of speed and greater car capacity. This we can have, but not with horses. We also want warmth and ventilation. A steam motor apparatus could supply more or less of the former, and lead to a better appreciation of the necessity of the latter, by lessening the discomfort of an influx of fresh air into a closely-packed car. As between freezing and partial suffocation, most people will prefer the latter. Then why not take some steps toward substituting steam for horses before another epizooty breaks out to disorganize the present clumsy system of transit? The argument that such a change will tend to multiply accidents is puerile, and is refuted by our constant experience. The horse can not be depended on like machinery; his temper is variable, he has a will of his own, he is not always to be trusted, and he is more likely than the locomotive to have a reckless driver. We think the proportion of accidents resulting from the use of steam-power on all the street lines of this city, would be less than those now caused by the present system. Other objections can doubtless be started by primeval conservatives and old fogies, but they are usually such as are hardly worth considering. It must not be imagined by this or any other class of objectors, that street-engines of whatever kind that may be introduced, are to be huge ponderous machines like a railway locomotive capable of hauling 200 tons of freight. A very low horse-power will be sufficient, and if a boiler and fire can be dispensed with, there will be not only greatly diminished bulk

and weight, but an entire absence of smoke and cinders.

The Greenwich Street Elevated Railway, as it is now successfully operated, can be regarded as little more than the pioneer or herald of reform. It shows that an elevated track is practicable, and that this system can be improved and extended so as to realize great results. This structure, it should be remembered, was for a long time the target of ridicule. People shied at it, and talked of "old iron" and mechanical stupidity; but now thousands of passengers travel daily upon it in roomy, well-furnished, and comfortable cars, snapping their fingers as they ride at the crawling pace of the horse-cars, and the innumerable street obstructions below.

Railroad Mileage for 1873.

THE record of new railroad construction for 1873, as published by the *Railroad Gazette*, shows an increase of 3777 miles during the year, and a total mileage of 70,857. The new construction mileage for 1872 was 7340, or very nearly twice as much as that of last year. The general statistics show that a little more than one half of the 70,857 miles of railway already constructed in the United States, have been built within the past eight years, a progress which recent events in our financial experience have shown to be too rapid to be advantageous, and consequently the falling off of fifty per cent in new mileage need not be regarded in the light of a calamity. The increase for 1873, although comparatively small, is in reality large, when viewed from a proper economical and financial stand-point, and we apprehend it will be no worse as it affects the credit and permanent prosperity of the country, if the record for the current year should show a still further falling off in new mileage. The work of the past year has been directed to the completion of roads previously begun, and which will of course make them the sooner available for traffic, and place them in a condition to test their capacity as paying investments. These roads are located mostly in the Western and South-western States, and so long as they remain in an unfinished condition, are a dead weight upon the owners by tying up and rendering unproductive a large amount of capital, to say nothing of constantly accumulating indebtedness.

The Standard Journal-Box.

AFTER much unexpected and unavoidable delay in completing the drawings of the standard journal-box and jaw approved by the committee appointed at the June meeting of the Association, we are now able to report that the work is in the hands of the engravers, and will soon be printed for distribution. The lithographic impressions will be half-size, embracing all necessary details and dimensions, so that they can be used as working drawings. They will be printed on heavy plate-paper unsuitable for mailing, and will consequently be sent by express, or delivered to parties desiring them, at the rooms of the Association or at the office of Vose, Dinsmore & Co.

A Correction.

IN the article descriptive of Allen's Centre-Bearing Swing-Beam Trucks, on the fifth page of our last issue, Mr. C. F. Allen, the inventor of the same, is referred to as "the present general manager of the Pullman Palace-Car Company's works at Detroit." This is an error. What we intended to say was, that Mr. Allen was the *former* general manager of the works. He retired from that position in August last, and was succeeded by Mr. T. A. Bissell, who is the present general manager.

D. M. LUKE has been chosen President, W. L. G. Thomas Secretary, and F. P. Ash Treasurer, of the Oxford Coöperative Car Company.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the rooms of the association on Thursday evening, January 15th. The following car-builders ware present: Messrs. M. C. Andrews, C. A. Smith, J. T. Leighton, W. E. Chamberlain, I. W. Van Houten, V. D. Perry, George Hackett, Leander Garey, F. D. Adams, Willis Davis, C. E. Garey, and D. H. Baker; also a number of other gentlemen, including M. N. Forney, Dr. J. G. Allen, Ambrose Ward, W. C. Baker, W. G. Creamer, and W. E. Partridge.

Mr. Van Houten, the president of the association, after calling the meeting to order, announced that Professor Leeds, who had accepted the invitation extended to him to deliver an address on ventilation, was unable to be present, but would, if agreeable to the association, defer fulfilling his engagement until the February meeting. The chair then announced that Dr. J. G. Allen, of Philadelphia, who had given special attention to the subject of ventilation, was present, and, if agreeable to the meeting, would submit his views on the general subject and its special application to railway cars.

Dr. Allen was then introduced and made some extended remarks, illustrated by diagrams. In the ventilation of rooms and buildings, he favored the theory of introducing and exhausting the air at the bottom or near the floor. There was no better ventilation than the old-fashioned fire-place, which indicated the principle which should be adhered to in applying modern methods. Air that was foul and unfitted for respiration had something in it that pure air had not; and whatever the contamination specifically might be, it was sometimes heavier and sometimes lighter than air that was pure. Warm air would rise and cold air fall, irrespective of any impurities either might contain; but in the absence of undue or artificial warmth, the worst impurities, those which were the most deleterious and deadly, undoubtedly fell to the floor. This was evident from the noxious gases which accumulated in old wells, vaults, and similar places. Warm air let in at the bottom of a room from a furnace rises at once to the top, and if there is any opening at the top, it passes out, carrying with it perhaps some of the odors of the foul air at the bottom, but without displacing or lifting up the foulness itself, or warming the air next to the floor. In order to make this warm air thus introduced available for practical ventilation, so as not to waste it and the fuel consumed in making it, the air already at the top must be pressed down, and the foul air at the bottom forced out to make room for it. This could only be done by having the exhaust-ventilators at the bottom, and these, as shown in the diagrams exhibited, communicating with a vertical flue or chimney passing up to the roof. Two bodies could not occupy the same space at the same time, and air was no exception to the rule. His experience in hospital ventilation had proved that when the air was exhausted at a point lower than the beds, the patients occupying such rooms were uniformly in a better condition. This method of exhausting air at the bottom had been recognized in Europe and approved as a settled principle in ventilation.

It might be said, however, that this would do very well for buildings or rooms, but would not answer for railway cars. He could not see the force of the objection. Cars could be exhausted at the bottom as well as ordinary rooms, and a draught could be provided by means of passages or flues in the car-walls answering to a chimney; and this bottom ventilation was facilitated by the movement of the car. The opening of doors and windows would interfere with it very little. The admission of cold air through openings of any kind in the sides of a car was sure to incommode some one. No one could safely expose himself to a current of cold air for any considerable time. If admitted at the bottom in cars heated with stoves in the ordinary way, it forced the warm air upward and kept the passengers' feet cold. Hot-water pipes along the bottom afforded a pleasant heat, but tended to drive the foul air up, so it could not escape at the bottom.

Dr. Allen then exhibited a diagram showing the application of his method of heating and ventilating, and which has been in use on some of the Pennsylvania roads. It consists of a stove or furnace of peculiar construction, placed underneath the car. The products of combustion are carried by an escape-pipe to the roof of the car, and the heated air from a chamber about the fire-box, is introduced into the car at various points along its sides just above the floor, and conveyed by pipes to openings under the seats, where it is spilled out into the car. It rises at once to the top and is then gradually forced downward, the impure air at the bottom escaping at the same time through openings along the aisle, from which it passes to the roof through the side-wall flues. The ventilation is effected entirely from the bottom.

Mr. W. C. Baker contended that the air was injured and some of its essential properties destroyed by contact with a stove or furnace, so much so as to cause coughing and irritability of the throat and lungs. Cars were not stationary like a house. There could be no draught in them like that of an ordinary chimney; and as regards a furnace under the car, he believed it to be impracticable. He had tried it and found it would not work. There was no current except immediately over the furnace, nothing to distribute the air through the car; it was unreliable on account of the variable force and direction of the winds, and an even temperature in the car was out of the question. We want a method that will radiate the heat around the feet of passengers. The best that could be done was to heat the car at the bottom and leave the top ventilators open. In this way a movement was kept up in the entire volume of air, and proper ventilation secured.

Mr. W. G. Creamer said he had nothing to say about heating. His one idea was, how to ventilate a car every day in the year, free from all connection with any thing else. He thought it a very simple matter. There was no part of the outside of a car-body so free from cinders, dust, and smoke as the frieze, and this was the point to admit the air. Taking it in under the end-hoods was very good when the wind was not blowing from behind the train; but an automatic deflector that would cause the speed of the train to force the air in at the frieze, no matter in which direction the cars were moving, was in his opinion the best method, and the best adapted to our exceedingly variable climate. He did not believe in the plan of exhausting at the bottom.

Dr. Allen thought the conditions of a house and car were not altogether dissimilar. It was easy to put a chimney in the latter by running a stove-pipe through the roof, and by exhausting at the bottom, instead of the top, would improve the qualities of Mr. Baker's heater. A car could not be properly heated unless the cold air is taken out at the bottom; and he would repeat that the foul air would be forced upward by radiated heat unless it could get in at the bottom. The cars on the Pennsylvania road with furnaces under them, worked well and gave entire satisfaction; and if any one doubted the utility of the method, he could only ask him to try it.

Mr. Chamberlain spoke of some experiments he had witnessed, testing the capacity of exhaust-ventilators in the dome and at the ends of the car. It took an hour to clear a car of smoke with twelve Creamer ventilators open in the dome, but by means of the end ventilators, it was cleared in ten minutes. He believed in taking in air at the top and exhausting at the bottom and referred to two methods which he had tried and which involves both heating and ventilation. In one case he introduced the air through the end-opening into a closet or casing surrounding the stove, where it was warmed, and from which it was conveyed in a flue along the top of the car and introduced into it at numerous openings, the exhaust ventilators being placed in the floor in the centre of the aisle. In the other instance, the warm air from the stove-casing was introduced from a flue at the bottom of the car instead of at the top. This latter method was found to yield the best results.

Mr. Forney thought that air should be exhausted both from floor and roof, but that the former should be so the passengers could not close it. Exhaust ventilation from the floor by means of a chimney or pipe extending above the roof, required to be carefully managed, or the current would be liable at times to travel the wrong way, or in other words, to get upside down.

Mr. Leighton regarded the discussion which had taken place as a very profitable one. It had demonstrated the correctness of the views he had heretofore expressed, that the impure and vitiated air was at the bottom of the car and not at the top. We want something to take it out, and this our present ventilators will do, only put them where they should be, and the bad air can't help but go out. He thought we had never got so near to "hard-pan" on this subject of ventilation as we had this evening.

Mr. Adams suggested the propriety of having some experiments made before the time of the next annual meeting of the association, with the view of testing, so far as practicable, the merits of the various plans and theories proposed, and that such experiments be witnessed by as many of the members of the association as can be present. The matter he thought could be matured by the committee on the subject of ventilation, etc.

The discussion was continued at considerable length, various gentlemen participating. The foregoing brief abstract contains only some of the leading points, which is all our space will permit. At the conclusion, a vote of thanks was unanimously tendered to Dr. Allen for his address.

The subject of journal-bearings was then taken up and discussed for about an hour, a mere summary of which would convey but a very inadequate idea of what was said by the various gentlemen who participated; and to attempt to give any thing more than that would far exceed our available space. Suffice to say that the discussion developed considerable difference of opinion and experience in regard to the different metals and amalgams used for bearings, and without arriving at any definite conclusions, the meeting adjourned. The next meeting will be held on the 19th of February, when the subjects of heating, lighting, and ventilation will be resumed, and an address delivered by Professor Leeds.

Railroad Servants.

AN English journal, in its "American Notes," refers, in the following terms, to the service of men employed on the railroads of the United States, and claims that they are overworked. These suggestions, whether there is less or greater reason for them, are at least worthy of consideration.

Captious, critical, and communicative enough on all other subjects connected with railway management, the public—probably from the apprehension of an onslaught on their pocket—fail to take interest in the deplorable overworking of railway servants. This is the more remarkable as it is impossible to resist the conviction that many accidents are directly referable to the irrepressible torpor produced in engine-drivers by the oscillations of the locomotive and the protracted hours of labor. It is ridiculous to suppose that men can keep all their faculties—on the keen exercise of which their own and other lives depend—in healthy operation during spells of fifteen or eighteen hours of work. Payment for overtime has been suggested as a remedy, but this, instead of decreasing the danger, would only increase it by inducing men to make unreasonable demands upon nature, for the sake of taking an extra bribe. The only real remedy is the employment of a more numerous staff; but financial reasons intervene, and the health, comfort, and lives of railway servants, as well as the security of the public, are sacrificed to the necessity of paying dividends on capital, which, in many cases, has been invested in unremunerative branches and "fancy" stations.

Salt as a Preservative for Wood.

WE may learn many things from the experience of others; but, unfortunately, we are very much inclined not only to overlook this, but even often to neglect the lessons of our own experience. The experience of many nations who possess an available seashore is, that timber immersed for some time in sea-water, before being sawed in the mill, is better, harder, and much more durable than if immersed in fresh water; and, in Holland, where very active ship-building has been going on for centuries, this fact is universally admitted, and its knowledge applied. It is also found that wooden piles driven in the sand of salt marshes last for an unlimited time. External causes of decay, such as dampness, may be made inoperative by the painting of the wood; but dry-rot takes place, irrespective of the presence of paint, and seems to be due more to heat than to dampness. Paint only protects wood from atmospheric causes of decay; but the internal dry-rot can only be prevented by treatment of the wood when seasoning, and among the simple and cheap preventives, salt appears to be the most available. It appears that, even after the dry-rot in timber has commenced, immersion in salt water effectually checks its progress and preserves the remainder of the wood. In the salt mines of Hungary and Poland, the galleries are supported by wooden pillars which last unimpaired for ages, in consequence of their having become impregnated with the salt. Pillars of brick and stone, used for the same purpose, crumble away in a short time by the decay of their mortar.

Waste No Time.

AFTER allowing yourself proper time for rest, don't live a single hour of your life without doing exactly what is to be done in it, and going straight through it from beginning to end. Work, play, study, whatever it is, take hold at once and finish it up squarely and clearly; then to the next thing, without letting any moments drop out between. It is wonderful to see how many hours these prompt people contrive to make of a day; it is as if they picked up the moments that the dawdlers lost. And if ever you find yourself where you have so many things pressed upon you that you hardly know where to begin, let us tell you a secret. Take hold of the very first one that comes to hand, and you will find the rest all fall into file, and follow after, like a company of well-drilled soldiers; and though work may be hard to meet when it charges in a squad, it is easily vanquished if you can bring it into line.

Todd's Coupling for Freight-Cars.

SINCE calling attention to this device in our December issue, we have had an opportunity of giving it a careful inspection, and we can not see why its general adoption should not put an end to the perils of coupling-cars and the sickening death-roll resulting therefrom. Unless there is a very great difference in the height of draw-bars, it is infallibly self-coupling, and can be uncoupled instantly by a chain from the top of the car or by levers on either side. It is mechanically simple, requires no pins, is not liable to get out of order, and is always ready. The cost is a trifle more than the ordinary coupling, but this is a mere nothing compared with the saving of pins. It has been adopted by the Boston and Albany road, and is on trial on a number of other leading lines. One or more sets of the castings will be furnished gratuitously to roads desiring to test it, by applying to Williams, Page & Co., of Boston, or to Vose, Dinsmore & Co., New-York. We hope to be able to illustrate and describe it more fully in our next number.

PROF. TYNDALL argues against the commonly taught notion that man requires absolutely pure air and water. Chemically pure air—air that is without a trace of ammonia, carbonic acid, or water—is, he says, not to be found, and the one thing certain about it is, that if it were, no one could live in it. Neither is pure water ever found in nature; and observation of the whole animal creation, including man himself, tends to show that pure water is not necessary, nor even demonstrably desirable. Every sunbeam which enters a darkened room shows how thick with solid impurities is the air which man breathes—yet no one on that account fears to breathe it; the same thing holds true in regard to water, but this need not necessarily make any one afraid to drink it. Neither all foreign matters, nor even all foreign organic matters, are of necessity unwholesome, and the votaries of strict science too often represent man as a being who must submit the world to a series of severe chemical operations before it is fit for him to live in.

YOUNG engineers will find the following recipe a good one for polishing the brass-work of their engines: Rub the surface of the metal with rottenstone and sweet-oil, then rub off with a piece of cotton flannel and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon removes the tarnish, rendering the metal bright. The acid must be washed off with water, and the brass rubbed with whiting and soft leather. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

PAINTING on tin-foil has reached so high a degree of perfection as to constitute a new and beautiful decorative art. The tin-foil is stretched on a moistened plate of thick glass and carefully smoothed, the design is painted in oils on the tin, and when perfectly dry it is varnished. The foil is then removed from the glass and transported on wooden rollers to the surface or object to which it is to be attached; this is covered with a non-hygrometric gum, and the decoration applied. The flexibility of the tin-foil enables the artist to attach it in the most perfect manner, even to surfaces which are very irregular.

A NEW wood-carving process has been invented by a Frenchman, who claims that his machine will produce wood-carving at the rate of a yard a second, and at a cost of about one per cent of those executed by hand-labor. The operation consists simply in passing the wood between cylinders forming matrices. The material, it is stated, is not deformed, and greater density is given to it by the pressure, while the sculpture is as delicate as that made by the chisel. The process can be used for producing cornices, furniture decoration, and similar ornamental work.

THE great iron bridge of the Chicago, Alton, and St. Louis Railroad Company, crossing the Mississippi River at Louisiana, Mo., was completed on the 23d ult. This bridge consists of nine spans, ranging from 160 to 260 feet in width. The draw, which is 444 feet in length, is the longest in the world. The total length of the bridge is 2052 feet, and in and of it are 5000 cubic yards of masonry, 50,000 cubic yards of rip-rap, 250,000 cubic yards of earth embankment, and its superstructure is all iron of the best quality.

THE new depot of the Boston and Lowell Railroad, in Boston, has been completed, and is now ready for use. It is the largest passenger-depot in Boston, and one of the largest in the country, nearly equaling in size the Grand Central depot in New-York. In addition to the necessary train-house, waiting-rooms, ticket-offices, and restaurant, the building contains all the general offices of the company, and room is also provided for the offices of the Massachusetts Central, which will use the Lowell line into Boston. The gas-lighting is done by a new method which turns on the gas and lights it at the burner by one current of electricity. A table has been arranged in the building with keys somewhat similar to those on a parlor-organ. The operator, by depressing the keys, lights or extinguishes the burners at pleasure.

THE famous Hoosac Tunnel was commenced in 1856. Its entire length is 25,031 feet, or very nearly 4¾ miles. The grade rises uniformly 26.4 feet to the mile from each end to the central shaft, which is 12,837 feet from the east end and 12,194 feet from the west end. In solid rock, the tunnel is 24 feet wide and 20 feet high, and where arching is required it is 26 feet wide and from 23 to 26 feet high. Much work still remains to be done in enlarging it to its full size and arching it where necessary. The aggregate amount expended thus far is about $10,145,000, and the completion of the tunnel tracks and approaches will probably cost $2,000,000 more. It is supposed that the natural air-current passing through it will be sufficient for ventilation without the aid of artificial chimneys.

DURING the year 1873, the number of freight-cars which passed over the new bridge at Albany, was 473,690, being an increase of 62,137 over that of the previous year. The smallest number going east in any one month was in January, being 17,331; and the greatest number in one month was in October, being 22,536. The greatest number bound west was in October, 23,431, and the smallest number in January, 16,340. Estimating the length of each car at 30 feet, the whole number placed in a line would reach 269 miles.

THE Lake Shore and Michigan Southern Railway Company have nearly completed at their shops in Cleveland a magnificent parlor-car, which will surpass in elegance of design and finish any thing hitherto produced at these shops, if not in the entire West. The car is now in the paint-shop.

THE *Railroad Gazette* reports 1283 accidents on roads in the United States and Canada during the year 1873, of which 392 were from collisions, 815 from derailments, 67 from other causes, and 9 from causes not known. The casualties foot up 276 persons killed and 1172 wounded.

A WOODEN railroad is suggested, to connect Clinton, Iowa, with the coal-mines at Knoxville. It is to be constructed of wood entirely, even to wooden rails and wooden car-wheels. Roads of this kind are constructed by placing cross-ties ten feet apart and laying stringers twenty feet long on them, the stringers to be eight inches square, hewed on two sides. The car-wheels are made of two-inch oak plank, bolted together, making them—the wheels—eight inches thick; an iron flange is bolted on the inside to keep them from jumping the track. The drive-wheels of the engine are bounded with vulcanized india-rubber.

THE Belgian state railroads have a larger proportion of rolling stock than any other, the number of freight-cars per mile being no less than 22½, yet the complaints of insufficiency of accommodations for shippers are constant and bitter every winter. A Belgian writer says that the stock of cars is so unskillfully managed that, while the average trip is less than forty miles, requiring but a few hours for the movement, the average time employed in loading and unloading and waiting to get upon the road is no less than three days. Out of 22,000 freight-cars owned by the state, he estimates that an average of 15,000 are on sidings all the time.

THE largest bridge in the world is to be constructed over the Frith of Forth. According to the *London Builder*, its height will be 150 feet, and the number of spans nearly 100. The smaller span will be 150 feet wide, which is beyond the average width of the largest spans in ordinary bridges; but the crowning marvel in the whole structure is the great span in the centre, which is to be 1500 feet, or nearly one third of a mile, in width, an extent unparalleled in any existing structure of the kind. The entire cost of the bridge will be at least ten millions of dollars.

New Publications.

The Manufacturer and Builder, for January, presents a varied and attractive table of contents, and is profusely illustrated. The topics discussed relate to new devices and inventions, important discoveries in science, and matters of practical interest to general readers as well as to the skilled artisan and progressive mechanic. Among other articles there is an elaborately illustrated one on The Theory of Bridge-Building, and another on House-Roof Construction. Published by Austin Black, 37 Park Row, New-York. Price, $2 a year.

THE *Railway Monitor*, of December 31, contains, in addition to its usual well-selected summary of current railway news, a statistical table embracing over 800 railroads, arranged in alphabetical order, and showing the length of each line, amount of rolling-stock, capital, funded debt, gross and net earnings, dividends, location of principal office, and end of fiscal year. The table is compact and comprehensive, and extremely convenient for reference. Published by William B. Dana & Co., 79 William street, New-York. Terms, $5 a year.

The Iron World, published in Pittsburg and Philadelphia, has been changed from a folio to a sixteen-page quarto. It is devoted to the interests of the iron trade, and publishes the largest metal price-current in the world.

The Railway Employé, published monthly at Fort Wayne, Indiana. The first or January number of this publication contains eight neatly printed pages, made up of original and selected matter of special interest to every class of railroad employés. There is a wide field of usefulness for such a publication, and the initial number gives evidence that the enterprise deserves to be successful. J. J. Grafton, late assistant superintendent of the Detroit, Eel River, and Illinois Railroad, is the editor. Terms, $1 a year.

THE first monthly issue of the *American Artisan* contains 32 pages exclusive of cover, and is a very attractive number. It is embellished with numerous illustrations, including an appropriate and tastefully designed frontispiece with a view of the East River bridge as it will appear when completed. The *Artisan* in its new form will be devoted as heretofore to scientific progress and the interests of mechanical industry, and especially to the education and advancement of the producing classes. Published by Brown & Allen, 258 Broadway. Price, $2 a year.

The American Builder, for January, contains a variety of articles of special interest to architects and builders. A leading feature of this publication consists in the large and well-executed drawings upon detached sheets which accompany every number. These drawings relate to plans and designs for construction which are invaluable to carpenters and others interested in building. Published by C. D. Lakey, 23 Murray street, New-York. Price, $2 a year.

Facetiæ.

ONE of the most heart-rending stories of the year comes from Fond du Lac. A young lady was passing through a piece of ground adjoining a farm-house with her lover, when the girl was attacked by a savage dog. Before her escort could protect her, the dog had seized her by the breast and torn the breast from her body. When the young man saw the dog shaking a portion of the body of his intended, he fainted away. The young lady, however, did not faint. She was so mortified that she seized a fence-rail and went for that dog, and she pounded him until he lay still. When her lover recovered, the young woman was trying to hide one of the wire screens that people put over plates to keep the flies off. It seems that the dog didn't draw blood, owing to the fashions at Fond du Lac, which it is needless to describe. However, there is great excitement there, and the young man has broken off his engagement and has bought that dog, what there is left of him, and he is going to set him again.

"I CAN NOT imagine," said an alderman, "why my whiskers should turn gray so much sooner than the hair on my head." "Because," observed a wag, "you have worked much harder with your jaw than with your brains."

WIVES are presumptuous creatures. They always ask for a lock of their lover's hair before marriage and take it without asking afterward.

THE obituary notice in a Western paper contained the touching intelligence that the deceased "had accumulated a little money and ten children."

A LITTLE boy, while reading a chapter in Genesis, paused to ask his mother if boys in the olden times used to do their sums on the ground. It was discovered that he had been reading the passage, "and the sons of men multiplied on the face of the earth."

A DAKOTA paper contains the following affecting epitaph: "Jim Barret has been shoveling snow, from which he caught a bad cold, and died. He won't have to shovel much snow in the country where he has gone to."

IRASCIBLE old party.—"Conductor, why didn't you wake me as I asked you? Here I am miles beyond my station." Conductor—"I did try, sir, but all I could get out of you was, 'All right, Maria; get the children their breakfast, and I'll be down in a minute.'"

TWO little girls were comparing progress in catechism study. "I have got to original sin," said one. "How far have you got?" "Me? Oh! I'm way beyond redemption," said the other.

A YOUNG sailor just returned from a long voyage was telling his mother about the flying fish in the Red Sea. The old lady indignantly refused to believe her son's story, but accepted without hesitation his account of the wheel of Pharoah's chariot which was brought up by his ship's anchor, because, as she well said, "we had Scripture for the proof of that."

A POLITICIAN, trying to find his way home, ran foul of a tree. He didn't dare to let go for fear of falling, and yet he wanted to go home. So he kept on walking till he went around the tree eleven and a half times—then let go, and struck a lamp-post. He went around this fourteen times, then stopped, looked to see where he was, and said: "All right, got so far now—know rest of the way home first-rate."

A LITTLE girl at school read thus: "The widow lived on a small limbacy left her by a relative." "What did you call that word?" asked the teacher, "the word is legacy, not limbacy." "But, Miss Johnson, my sister says I must say limb, not leg."

WRITING a sketch of his life, an Irishman says that he early ran away from his father because he discovered that he was only his uncle.

A PORTLY gentleman crowded himself into a seat in a horse-car, next to a young man who remarked, "You wouldn't be so anxious to have that seat if you knew that I had just gotten over the small-pox." "That's nothing," was the reply; "this is the first time that I have been out since having it myself." The young man started for the front platform.

"WHY don't you get down and lead the horse? That is the way to keep warm," said a gentleman to a boy one cold day. "No," replied the American youth, "it is a b-b-borried horse, and I'll ride him if I freeze."

The Railroad Gazette

FOR 1874.

A new feature of special interest will be added to the RAILROAD GAZETTE for the year 1874, in the shape of a

CATECHISM OF THE LOCOMOTIVE,

which will give in the form of question and answer A FULL DESCRIPTION OF THE LOCOMOTIVE ENGINE, the principles of its construction and working, and instructions as to running it and keeping it in order.

This Catechism is intended especially for the instruction of firemen and locomotive runners and those who wish to qualify themselves for these positions, is elementary, and within the comprehension of all, and contains just that information about the locomotive which EVERY RAILROAD MAN OUGHT TO HAVE, and which no railroad officer who deals in any way with the running of trains can afford to be without.

This Catechism, based upon a German work, will be made essentially a new treatise, and especially adapted to American engines and practice, by M. N. FORNEY, Mechanical Engineer, assisted by PRACTICAL LOCOMOTIVE ENGINEERS, and will be fully illustrated.

The other features of the RAILROAD GAZETTE will be fully maintained. Its railroad news will be made full and accurate; its CONTRIBUTIONS FROM PRACTICAL RAILROAD MEN numerous and varied; it will have discussions of all branches of railroad business, and especially thoughtful and impartial investigations of the RELATION OF RAILROADS TO THE COMMUNITY, now absorbing universal attention.

It is believed that every railroad officer and employee who desires to keep himself ABREAST WITH THE TIMES ON RAILROADING, will find the RAILROAD GAZETTE a great help to him. Many leading Railroad men, including Presidents, Superintendents, Chief Engineers, Master Mechanics, Master Car Builders, Road Masters, Superintendents of Telegraph, Train Dispatchers, General Freight and Ticket Agents, Auditors, Bridge Builders, Professors of Engineering, Manufacturers of Tools and Materials, and Railroad Bankers, have contributed to its columns, and its circle of contributors grows constantly larger, so that it has in every department PRACTICAL INFORMATION FROM PRACTICAL MEN.

The RAILROAD GAZETTE is published at No. 73 Broadway, New-York, and No. 77 Jackson Street, Chicago, at $4 per year, in advance. Subscriptions will be received for six months at $2, and the publication of the "Catechism of the Locomotive" will be completed within the first half of 1874. Clubs of ten will be received at $35 per year.

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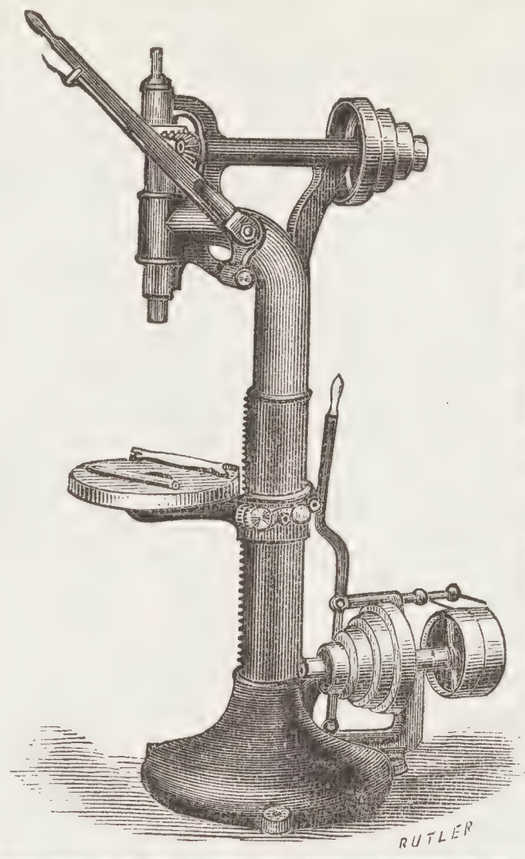

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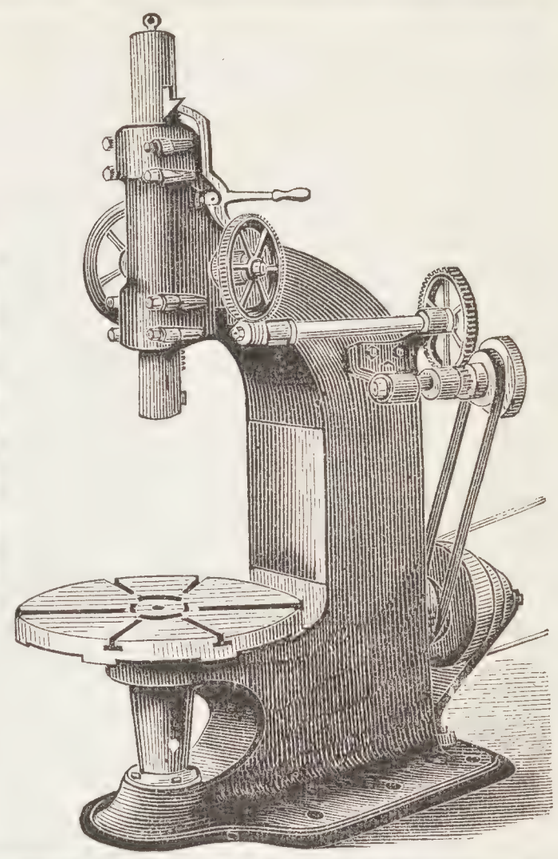

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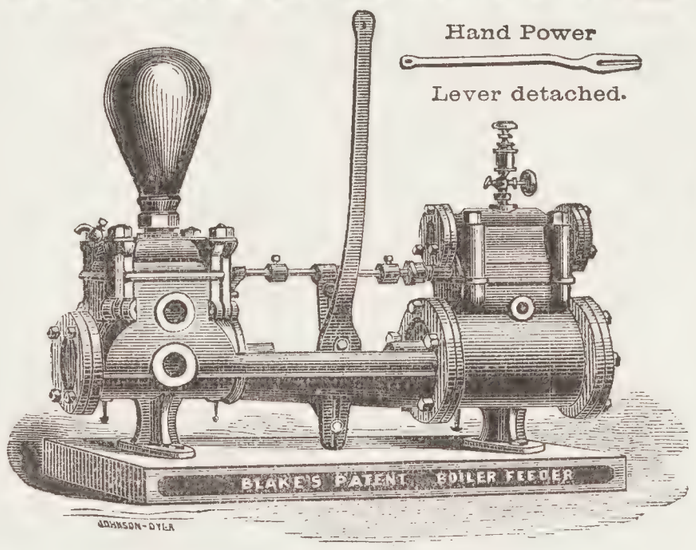

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SPRINGFIELD, MASS., October 4, 1871.

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AURORA, ILL., March 5, 1873.

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Bradley, Osgood	Worcester, Mass.
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Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
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Dawson Manufacturing Co	Dawson, Ga.
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McVay, Walker & Co	Braddock's Field, Pa.
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Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
Myers, H. S. & Co. (small cars)	York, Pa.
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Vigo Foundry and Terre Haute Car-Works	Terre Haute, Ind.
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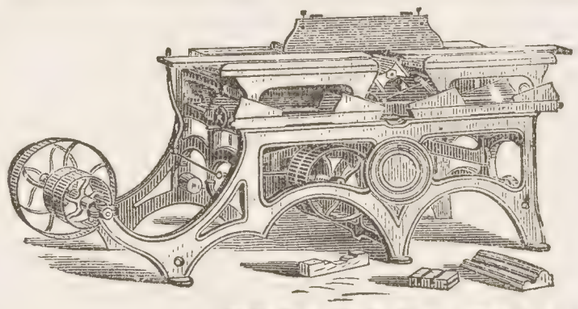

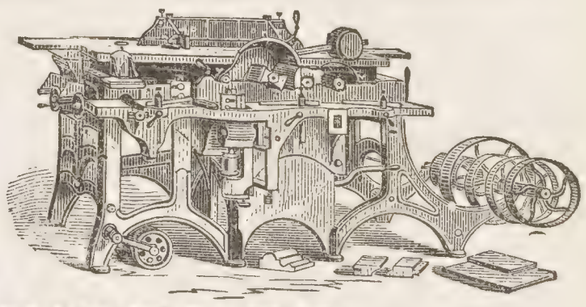

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Atlanta & West-Point	R. D. Cole	R. D. Cole	Newnan, Ga.
Atlantic & Gulf	C. E. Van Vorst	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
Atlantic & Great Western		††J. H. F. Wiers	Meadville, Pa.
Atlantic & Great Western	William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Haggard	Cleveland, Ohio.
Atlantic & Great Western	‖J. B. Miller.	S. V. Smith	Kent, Ohio.
Atlantic & Great Western	Allen Cook	J. W. Holmes	Galion, Ohio.
Atlantic & Pacific	§John Hewitt	E. Martin	St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South-Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
Allegheny Valley	G. W. Glass	R. Gunning	Pittsburg, Pa.
Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack.	Baltimore, Md.
Baltimore & Ohio		James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott		Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
Central Ohio Division	Alex. Platt		Zanesville, Ohio.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, Ohio.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Maine.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere Delaware	R. McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill	W. E. Chamberlain	Allston, Mass.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
Blossburg & Corning	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Blue Ridge			Anderson, S. C.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer	Jacob Williams	Oil City, Pa.
C			
Cairo & Fulton	L. Finlay	L. Finlay	Little Rock, Ark.
California Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern	C. E. Benton	C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	A. J. Prescott	C. D. Ellis	Catawissa, Pa.
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach	Catasauqua, Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bossinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co.	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. Q. Seats	Columbia, S. C.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	Thomas Hull	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division	D. Manning	Hugh Gray	Chicago, Ill.
Wiscon. Mad. & Mill. Divis	T. B. Tilton		Chicago, Ill.
Iowa Division	C. C. Elliott	William Campbell	Clinton, Iowa.
Peninsula Division			Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender		Burlington, Iowa.
Eastern & Middle Division		W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	J. D. Besler	Galesburg, Ill.
Quincy Division	Joel West.		Cresson, Iowa.
Burlington Division	S. E. Burtch		Burlington, Iowa.
Buda Division	P. R. Sutton		Buda, Ill.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	A. B. Bedell	W. H. Dunham,	Danville, Ill.
Chicago, Danville & Vincennes	J. M. Sanborn		Chicago, Ill.
Chicago & Canada Southern	§§J. Johann		Trenton, Mich.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Divison	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn	John Y. Beattie	Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Horace Alden	Horace Alden	Lyndon, Vt.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	J. W. Sauerbach	Mt. Savage, Md.
Central of Georgia	D. D. Arden	C. C. Millar	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas.
Central R. R. of Iowa	F. B. Woodruff	T. L. Seevers	Marshall, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
D			
Dakota & Southern	Jas. Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul's	James Russell		Peoria, Ill
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa.
Morris & Essex Division	W. H. Lewis	L S. Barber	Hoboken, N. J.
Des Moines Valley	James Lamb	R. E. Smith	Keokuk, Iowa.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. G. Roberts		Detroit, Mich.
Delaware & Hudson Canal Co	James Dickson	Thomas Orchard	Carbondale, Pa.
Rensselaer & Saratoga Div	John Dikeman		Troy, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	J. M. Smith	J. M. Smith	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East-Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
East Pennsylvania		Samuel Reeves	Reading, Pa
Elizabethtown and Paducah	W. D. Robb	T. A. Cordrey	Elizabethtown, Ky.
Erie Railway	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna, Pa.
Erie Railway	‖V. Blackburn		Jersey City, N. J.
Erie Railway	‖J. G. Hubbard	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E. Cooper	W. E. Cooper	Hornellsville, N. Y.
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Jno. G. Coulon		Galveston, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Richard Eaton	J. W. W. McWood.	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Sol. Bills	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman	T. M. Preval	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland, Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H. L. Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	§W. H. Purdy	W. H. Purdy	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	J. Salisbury	M. Tellerhoof	Saxton, Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes.	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. T. Sanford	R. B. More	Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh.		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas	Chester, S. C.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey	E. R. Brown, Mauch Chunk, Pa.	South-Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	A. Mitchell		Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson.	Ellis Dodge	Hunter's Point, IL.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo. N. Y.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River, Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Macon & Western	D. M. Gogul	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta & Pittsburg	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	M. Thornton	M. Thornton	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe. Ohio.
Memphis & Little Rock	Tho. Rennells	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Mississippi Central	Henry Gibbon	John E. Becton	Water Valley. Miss
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific			Nebraska City, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere, Wis.
Milwaukee & St. Paul	T. S. Davis	Wm. E. Kittredge	Milwaukee, Wis.
Milwaukee & St. Paul		John Baillie	Milwaukee. Wis.
Milwaukee & St. Paul	J. Pattee	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Grand River Valley Division		James Potts	Jackson, Mich.
Jackson, Lans'g & Saginaw Div	Andrew Wilson	Andrew Wilson	Jackson Mich.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio	B. S. Skates	John McHugh	Mobile, Ala.
		Jacob Huy	Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte. Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	Fredericton, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	††Joseph Jones	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan	John McKenna	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y.
New-York & Oswego Midland	‖Wm. H. Griggs	Wm. H. Griggs	Oswego, N. Y.
Eastern Division	J. F. Sechler	J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, Jackson & Gt. Northern	N. Greener	N. Greener	New-Orleans, La.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New-Orleans, Mobile & Texas	J. R. White	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Northern	James W. Lander	Albert Langmaid	Concord, N. H.
Northern of New-Jersey	T. W. Demorest		New-York.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	Jacob Williams	Oil City, Pa.
Oil Creek & Alleghany	H. J. Bookhammer	John Monks	Oil City, Pa.
Ohio & Mississippi		G. Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott	Chas. Hyatt	East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	J. D. Linning		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	John Hewitt	St Louis, Mo.
Pennsylvania	§§F. Thomson		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa.
Pennsylvania	E. L Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division.	John Headden	David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	James F. Elder	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburgh, Cincinnati & St. Louis			
Pittsburgh & Columbus Division	E. Pierce		Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Pendleton, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlain	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Washington & Baltimore	A. S. Kinsey		Pittsburg, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	C. W. Furber	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village N H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester.	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y

Q

Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.

R

Raleigh & Gaston.	J. B. Gayle	J. B. Gayle	Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	H. Longest	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis & Iron Mountain	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	Geo. H. Griggs	M. Heitzman	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall.		Columbus, Ga.
South-Western of Georgia	D. M. Gogul	James A. Knight	Macon. Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Seaboard & Roanoke	§E. G. Ghio	J. B. Pendleton	Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Daughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Maynes.	W W. Peirce	Selma. Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Sheboygan & Fond du Lac	A. F. Wallace.	A. F. Wallace.	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N. Y.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.

T

Taunton Branch.	W. M. Parks	J. G. Codding	Taunton. Mass.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans.	R. B. Baer		Houston, Texas.
Texas & Pacific	W. H. Hipple		Marshall, Texas.
Tennessee & Pacific.	William McKeand	William McKeand	Nashville, Tenn.
Toledo, Wabash & Western	**G. W. Cushing		Fort Wayne, Ind.
Toledo, Wabash & Western		David Hoit	Toledo, Ohio.
Toledo, Wabash & Western			Springfield, Ill.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.

U

Union Pacific	§I. H. Congdon	Geo. E. Stevens	Omaha, Nebraska.
Utah Central	Thos. Pierpont	Edward Cox	Salt Lake City.
Utica & Black River	Wm. E. Granger	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vicksburg & Brunswick	James Boon	J. A. Knight	Eufaula, Ala.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	George Hall	W. J. Calais	Wilmington, N. C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	Jas. F. Van Horn		Coatesville, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina.	J. D. Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
A			
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Albany, N. Y.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.
B			
Baltimore & Ohio	Thos. L. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J. N. Dubarry		Baltimore Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	J. B. Winslow		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.
C			
Cairo & Fulton	J. H. Morley	W. H. Hallett	Little Rock, Ark.
Cairo & St. Louis	C Hamilton		St. Louis, Mo.
Cairo & Vincennes	L. W. Palmer		Cairo, Ill.
Camden & Atlantic	E. Collings		Camden, N. J.
Canada Souhern	*J. S. Casement		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	D. Williams		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Sacramento & Oregon Division	J. A. Fillmore		Sacramento, Cal.
Western & Visalia Division	E. C. Fellows		Oakland, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humbolt Division	R. S. Mattison		Carlin, Nevada.
Salt-Lake Division	R. H. Pratt		Ogden, Utah.
California & Pacific Division	A D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart		Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	J. H. Stewart		Madison, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. T. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	R. C. Tate		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Pekin & Southwestern	N. J. T. Dana		Streator, Ill.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati, Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	J. W. Haight	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough		Cleveland, Ohio.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Akron, Ohio.
Colorado Central	T. E. Sickles		Golden, Col.
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Wm. M. Parker		Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning & Tioga	L. H. Shattuck		Blossburg, Pa.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
D			
Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. S. Meckling	J. S. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Urbana, Ill.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware, Lackawanna & Western	W. F. Halstead	G. W. B. Cushing	Scranton, Pa.
Morris & Essex Division	Andrew Reasmer	G. W. Bleashing	Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Des Moines Valley	John Givin	G. E. Kilbourne	Keokuk, Iowa.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese		Detroit, Mich.
Dorchester & Delaware	D. Stewart Hessey		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.
E			
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)	J. Prescott	C. W. Pratt	Boston, Mass.
Elizabethtown & Paducah	D. Brock	D. Brock	Elizabethtown, Ky.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo, N. Y.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Erie & Pittsburg	John M. Kimball	Wm. Mullins	Erie, Pa.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.
F			
Fitchburg	Chas.L.Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	*H. C. Potter		East-Saginaw.Mich.
Florida Central	F. P. Papy		Jacksonville, Fla.
Flushing & North-Side	I. D. Barton		Hunter's Point, L.I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	H. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.
G			
Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson		Augusta, Ga.
Gilman, Clinton & Springfield	S. H. Melvin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich
Grand Rapids & Indiana		William Mullins	Pittsburg, Pa.
Grand Trunk	C. J. Brydges	John Taylor	Montreal, Canada.
East Division	Henry Bailey		
West Division	W. J. Spicer		
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin	D. N. Kelly		New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.
H			
Hannibal & St. Joseph	L. W. Towne		Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport. Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top	J. McKillips	B. A. Knight	Huntingdon, Pa.
I			
Illinois Central	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	George L. Barringer		Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell		Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.
J			
Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	S. Conant		Jacksonville, Fla.
Jefferson, Madison & Indianapolis	Horace Scott	Wm. Mullins	Louisville, Ky.
Junction & Breakwater	John A. Sheaff		Lewis, Del.
K			
Kansas Central	A. E. Buchanan.		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		Detroit, Mich.
Kansas Pacific	Edward S. Bowen		Kansas City, Mo.
Kansas Pacific	J. L. Woods		St. Louis, Mo.
Kaw Valley Division	George Noble		Lawrence, Kansas.
Smoky Hill Division	O. H. Dorrance		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Knox & Lincoln	C. A. Combs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound	G.W. B.Cushing	Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card		Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	Chas. B. Peck	E. O. Foote, Jr.	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
	L. Chamberlin		Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	E. C. Dawes		Terae Haute, Ind.
Long Island	I. D. Barton	Oliver Charlick	Hunter's Point, L. I.

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Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	M. Stanton		Birmingham, Ala.
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Louisville, New-Albany & Chicago	M. Sloat	J. R. Parker	New-Albany, Ind.

M

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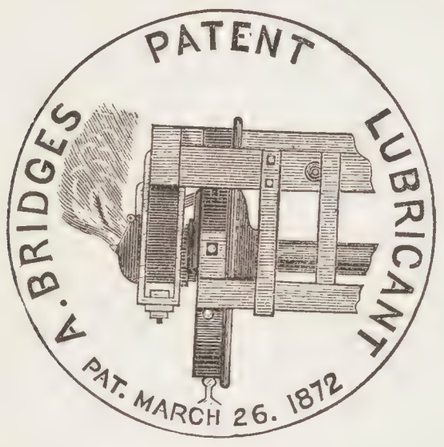

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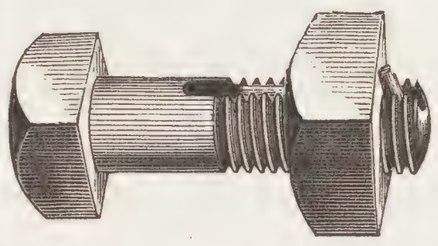
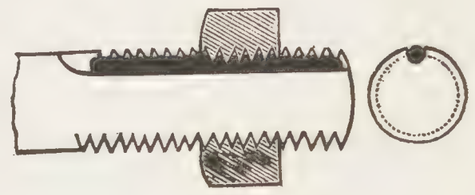


"CUMMING NUT-LOCK,"
Patented
June 16, 1868,
August 23, 1870.



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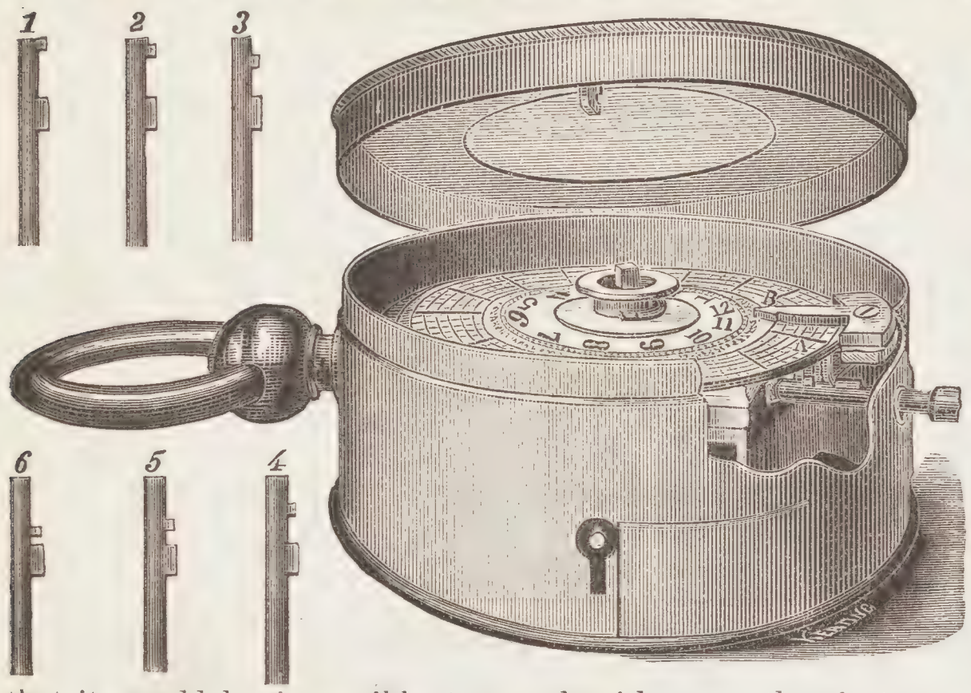

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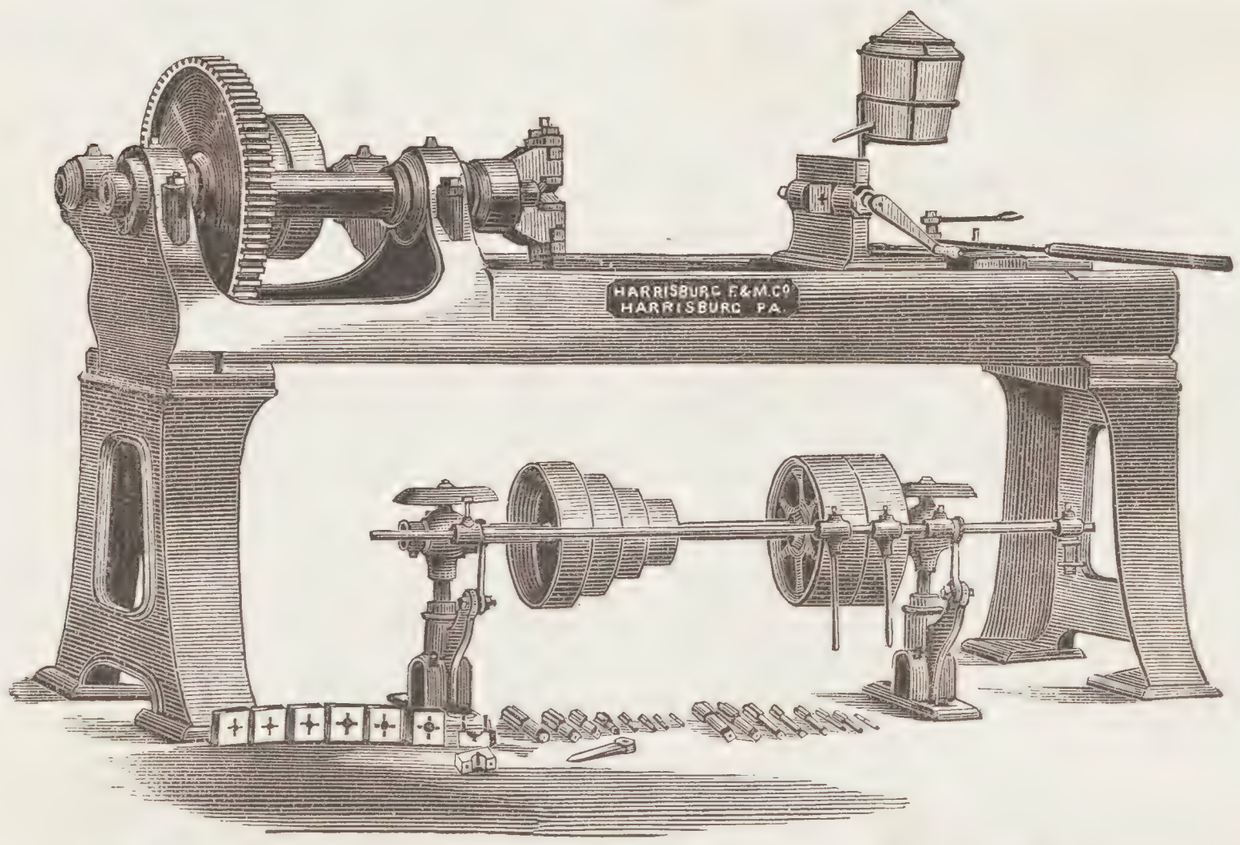

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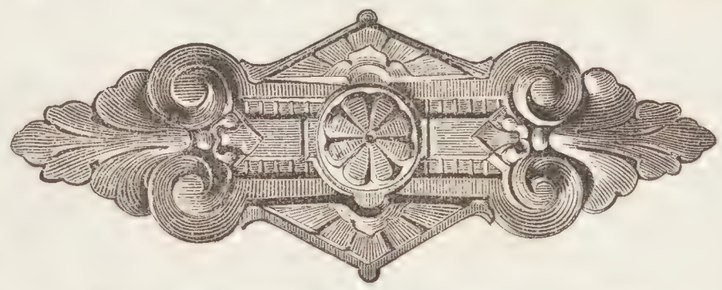

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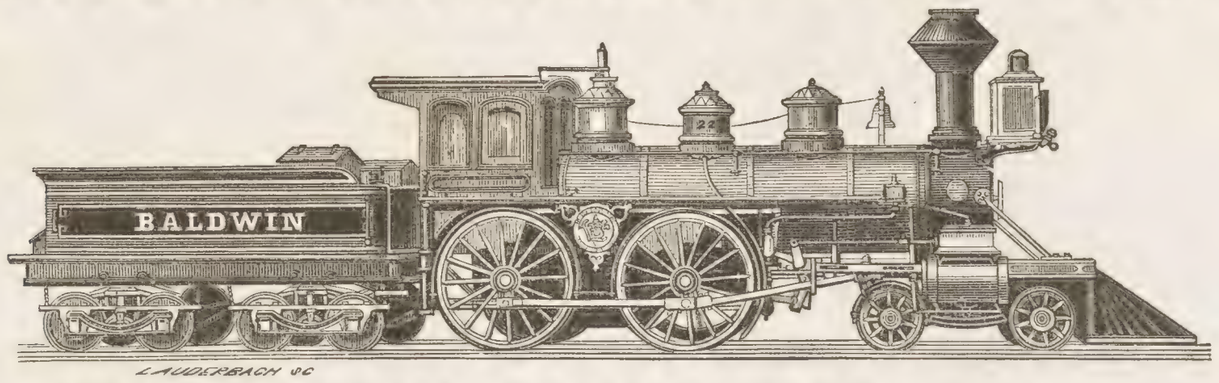

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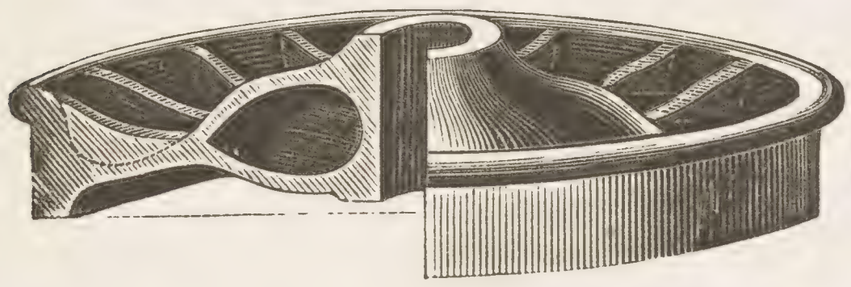

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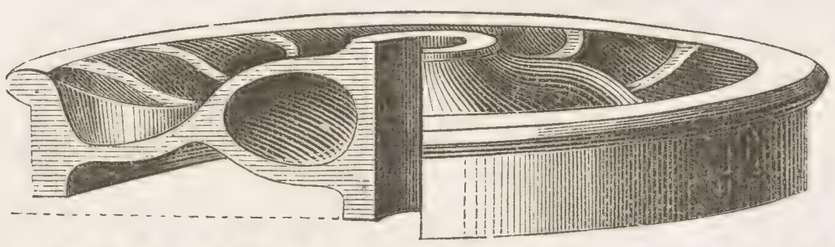

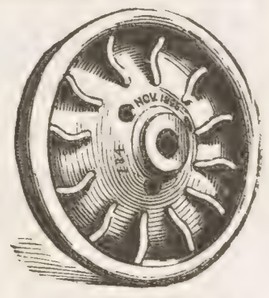

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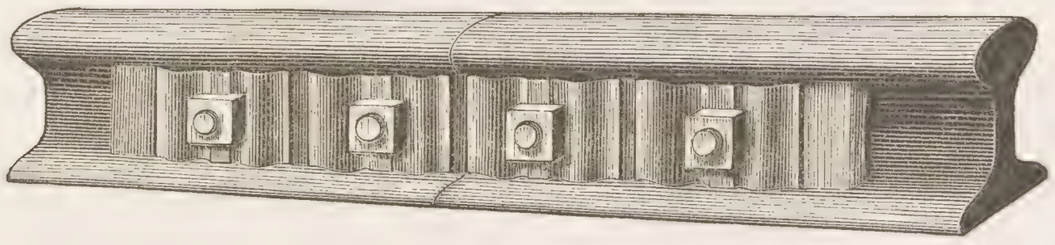

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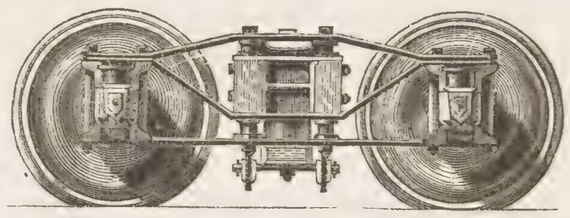

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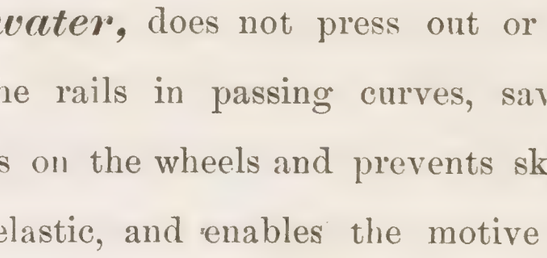

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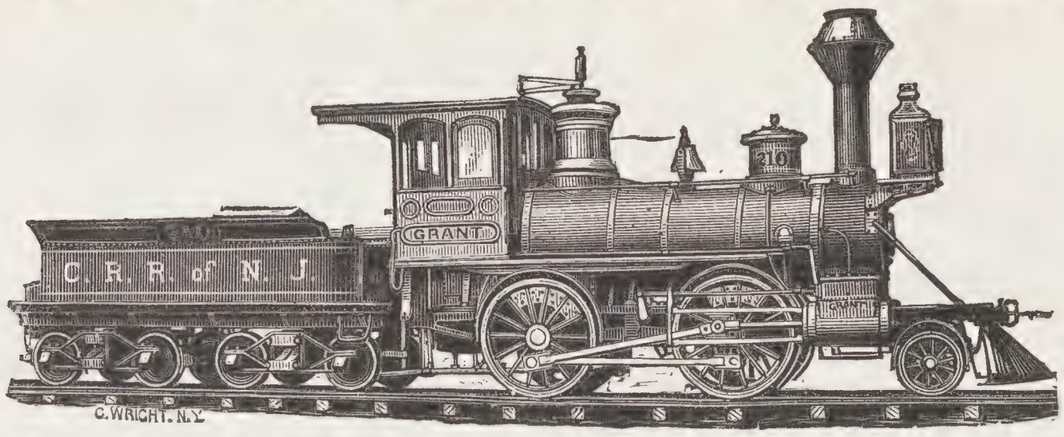

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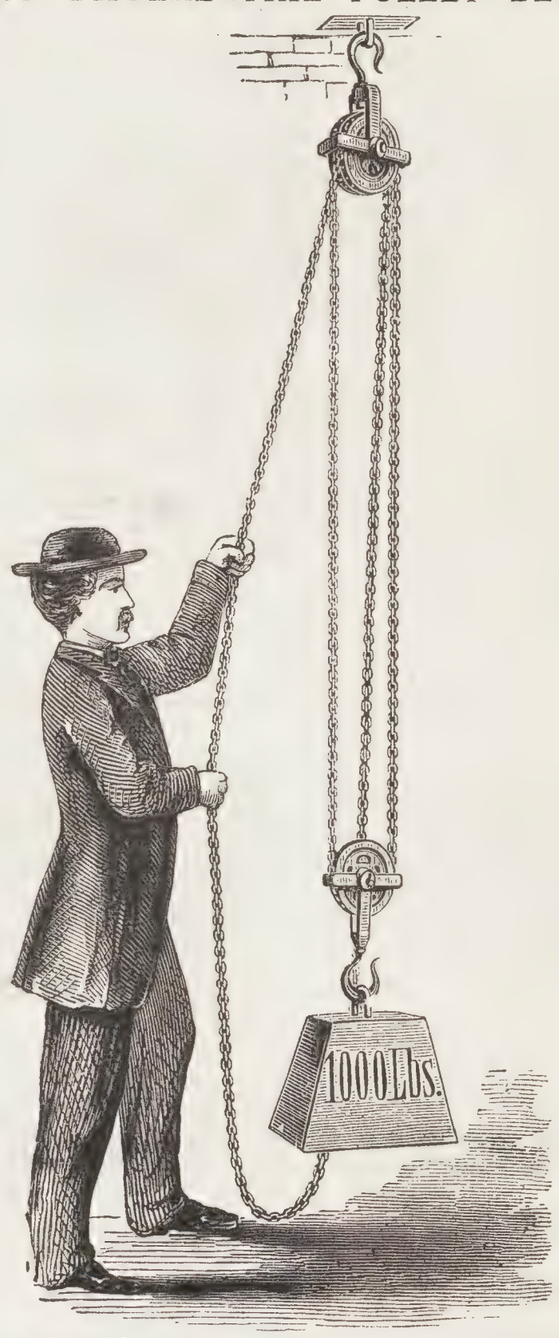

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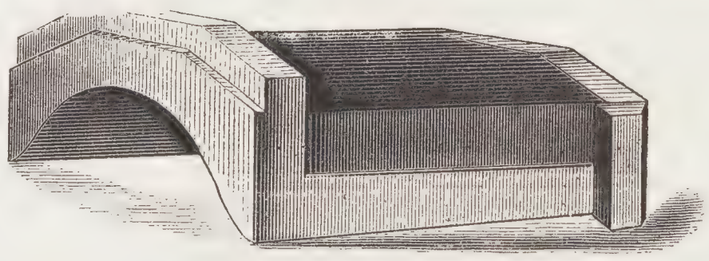

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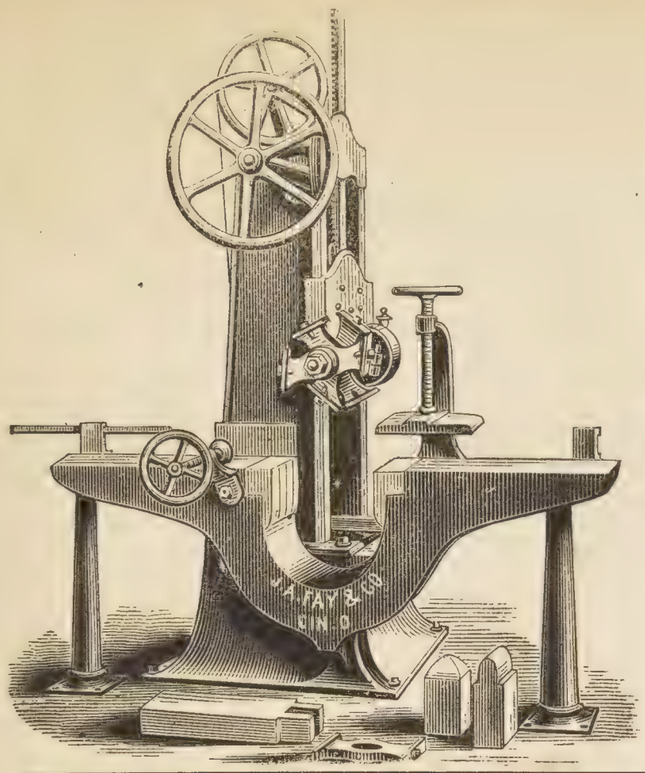

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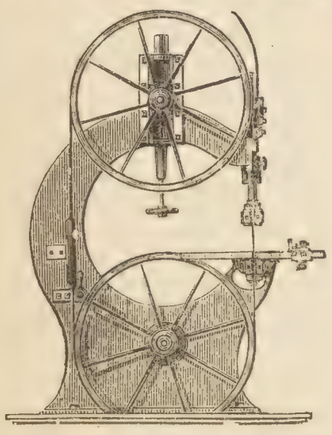

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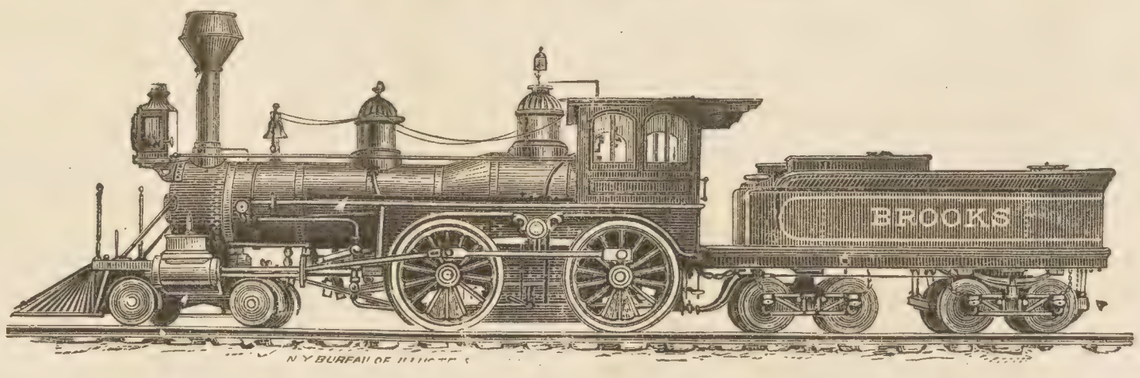

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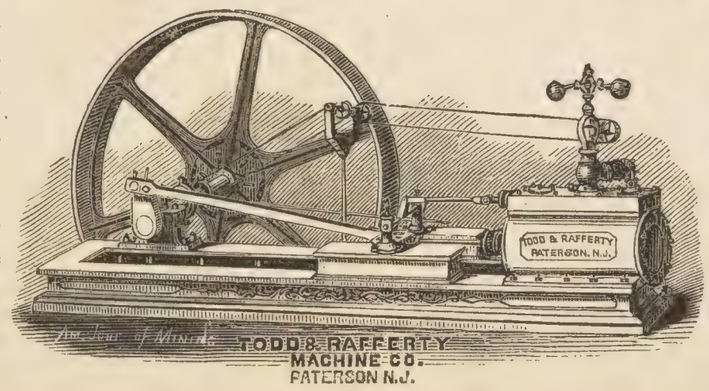

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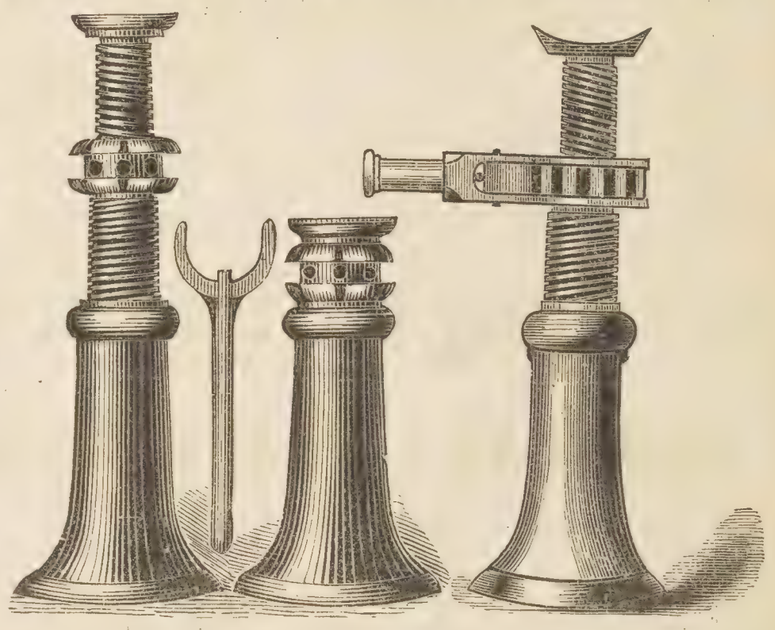

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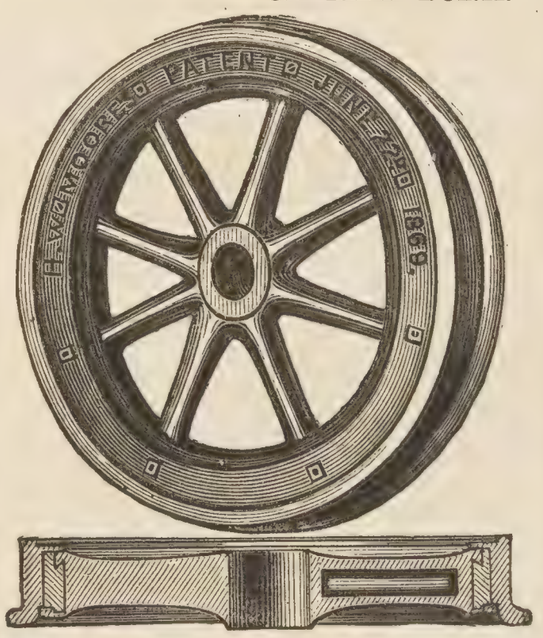

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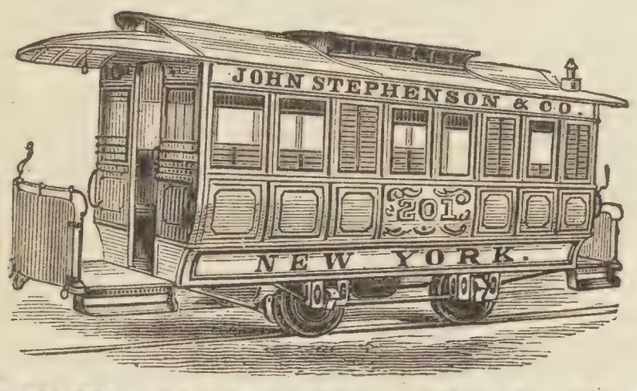

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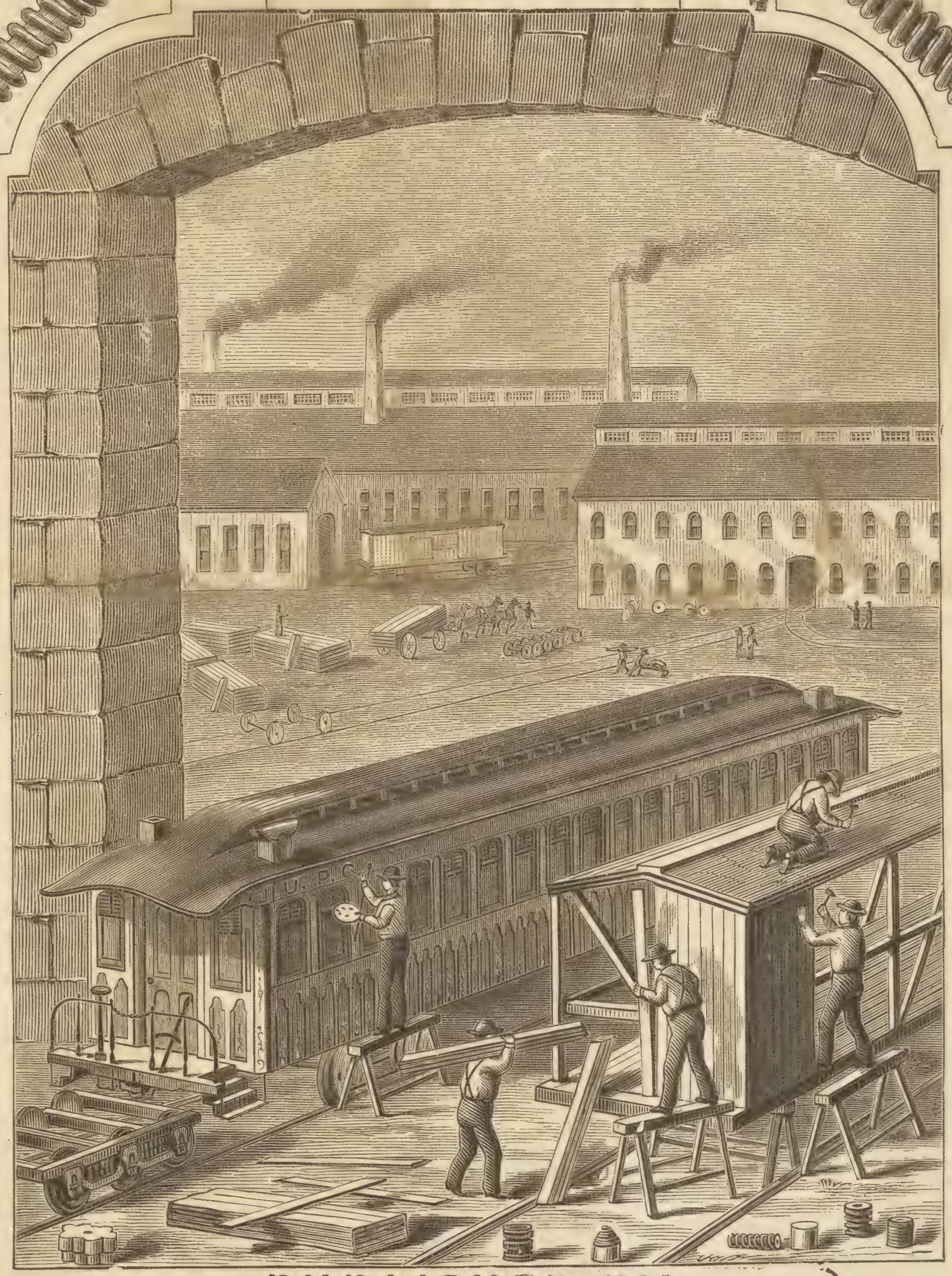
Vol. V. MARCH, 1874. No. 3.



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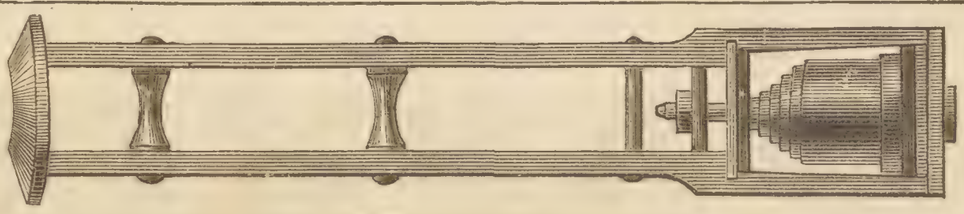

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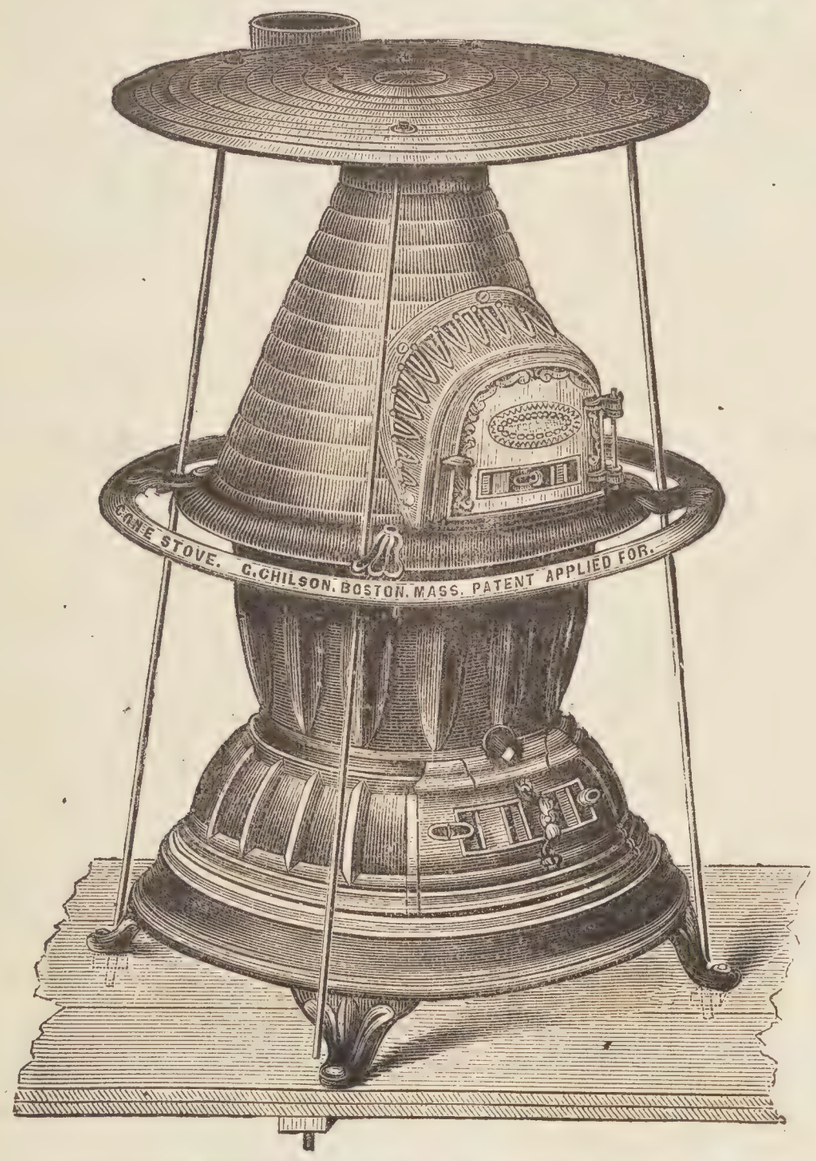
A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

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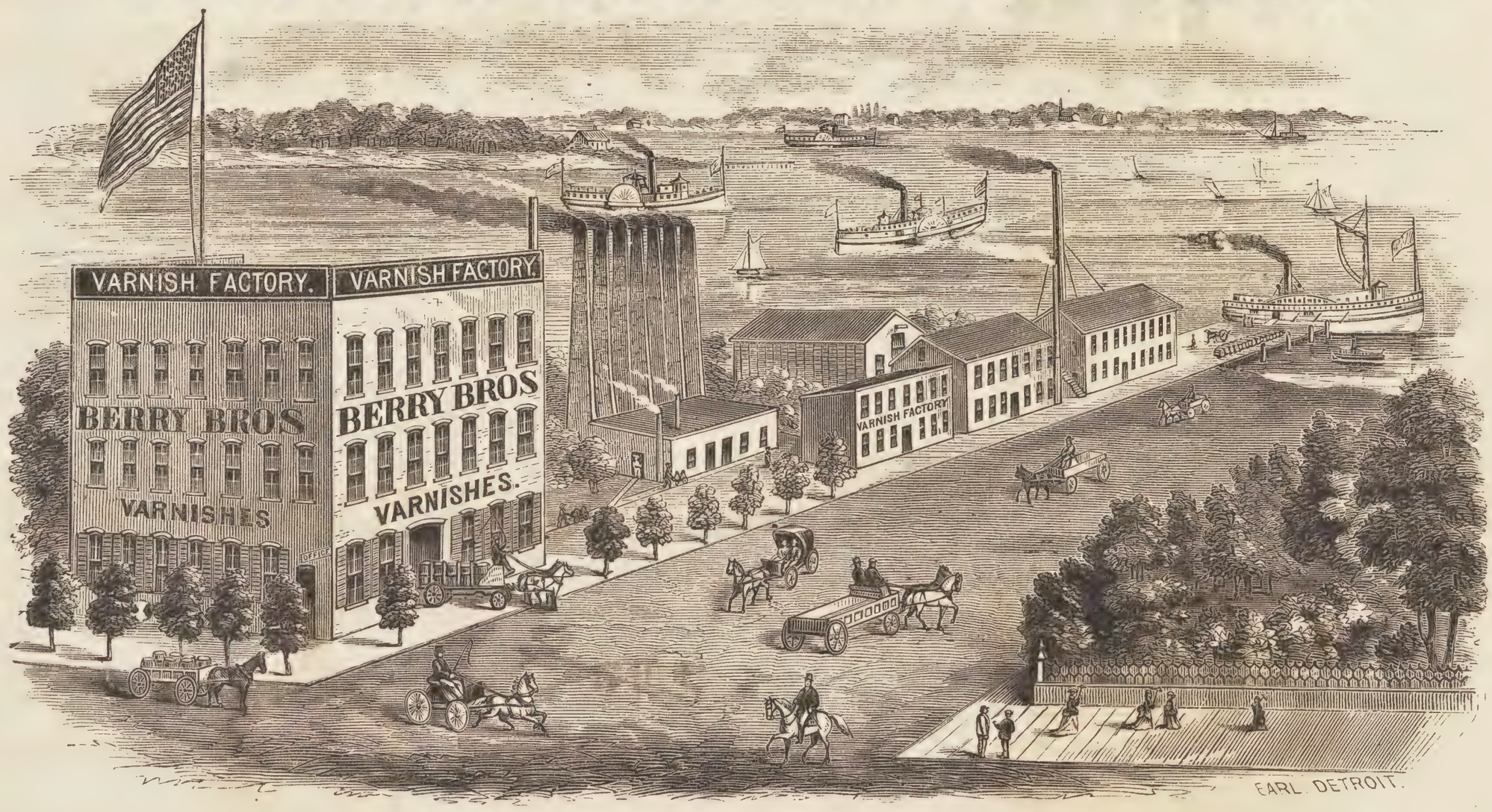

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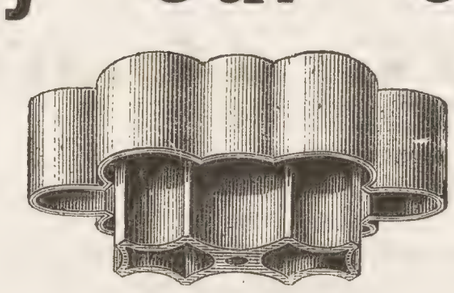

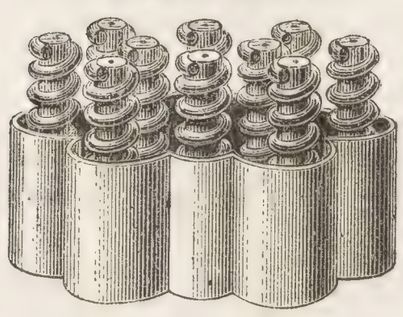

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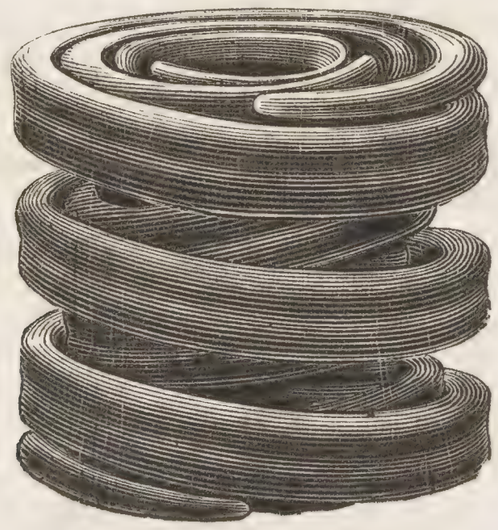

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Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

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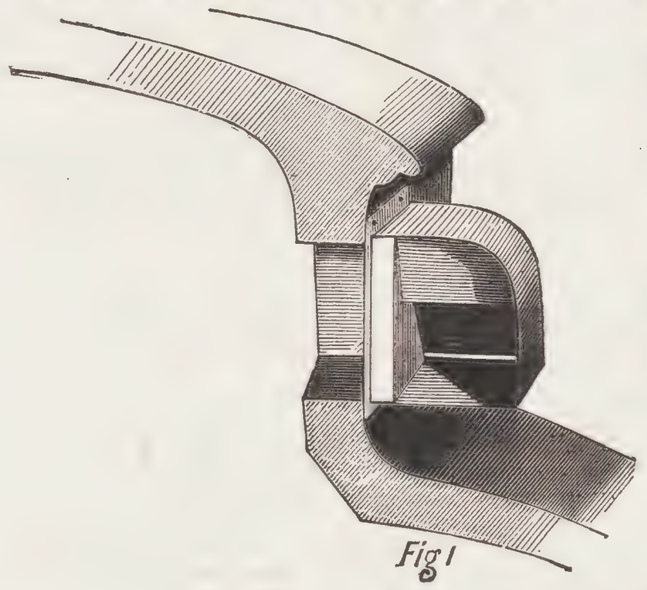
Fig 1

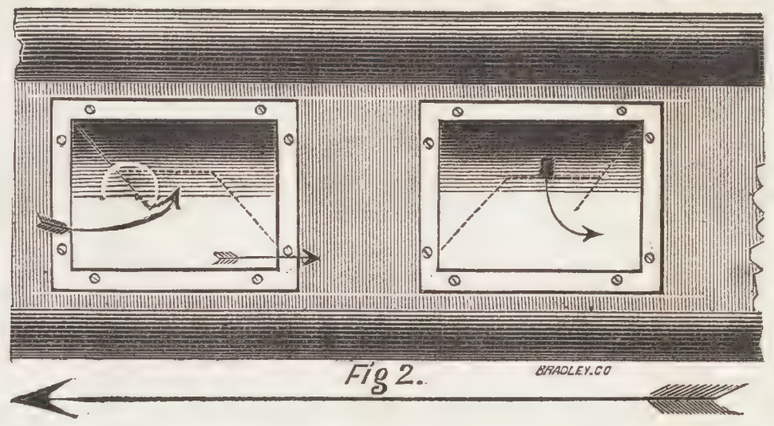

Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

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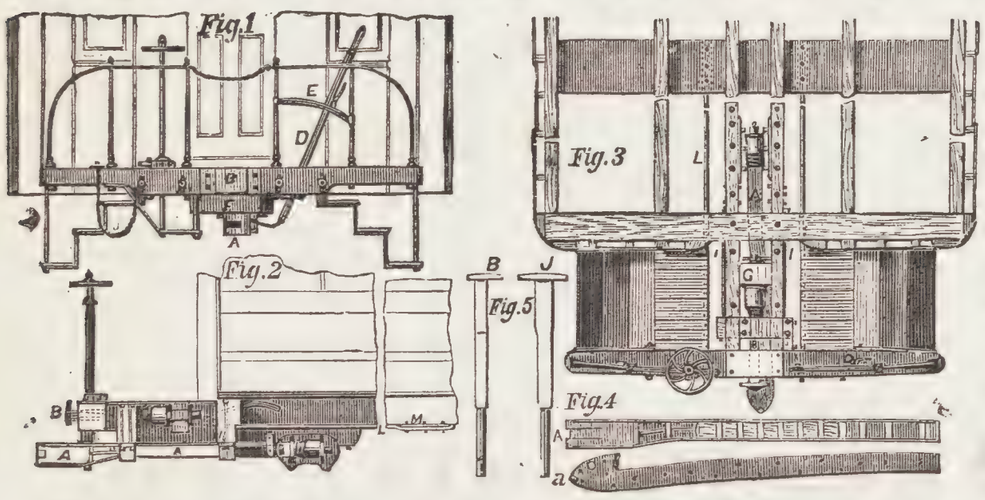
MILLER'S TRUSSED PLATFORMS. Compression Buffers and Automatic Couplers for Railroad Passenger Cars.



Office, 231 Broadway, (Rooms 4 and 5,) New-York.

Send for Illustrated Pamphlet, and call and see working models. E. MILLER, Patentee.

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied; and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

DELAWARE CAR WORKS.

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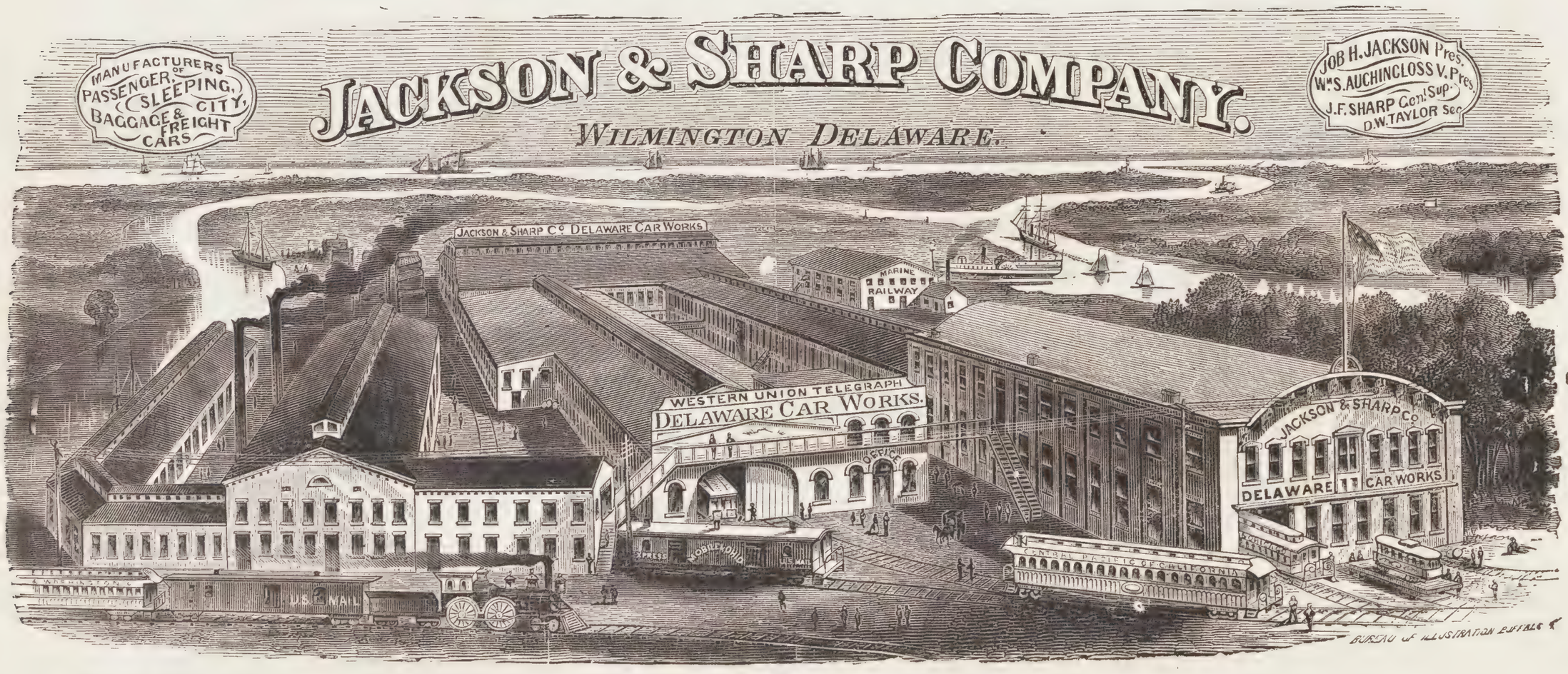

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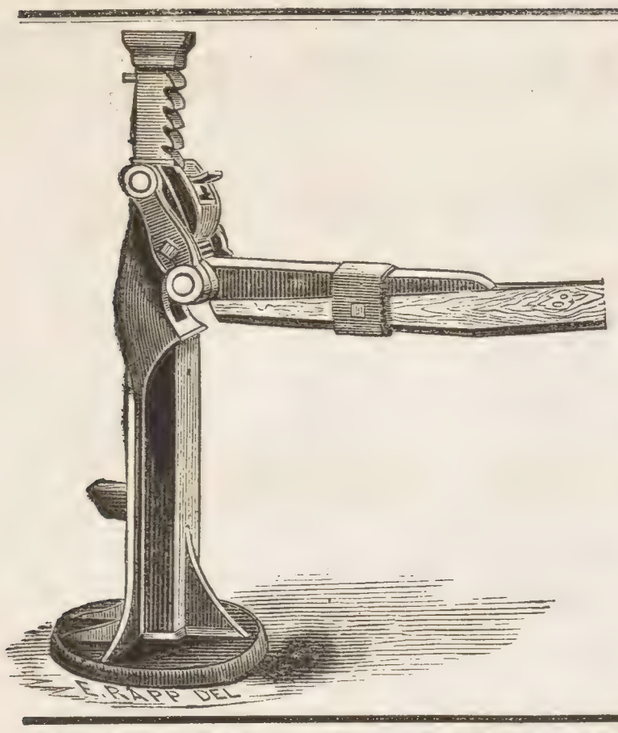

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BRIDGE AND RAILROAD WORK.

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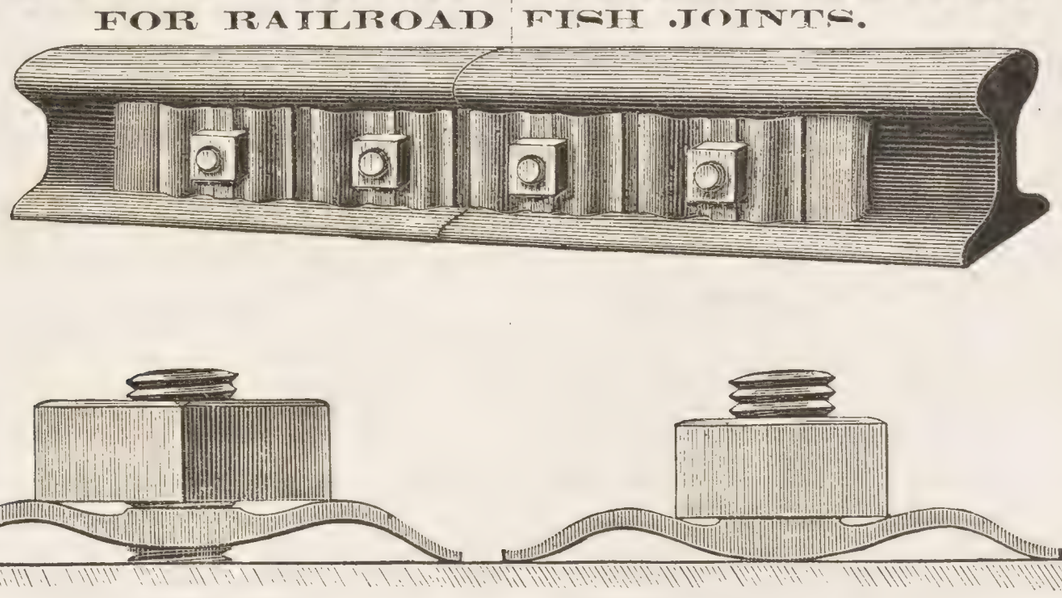

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These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

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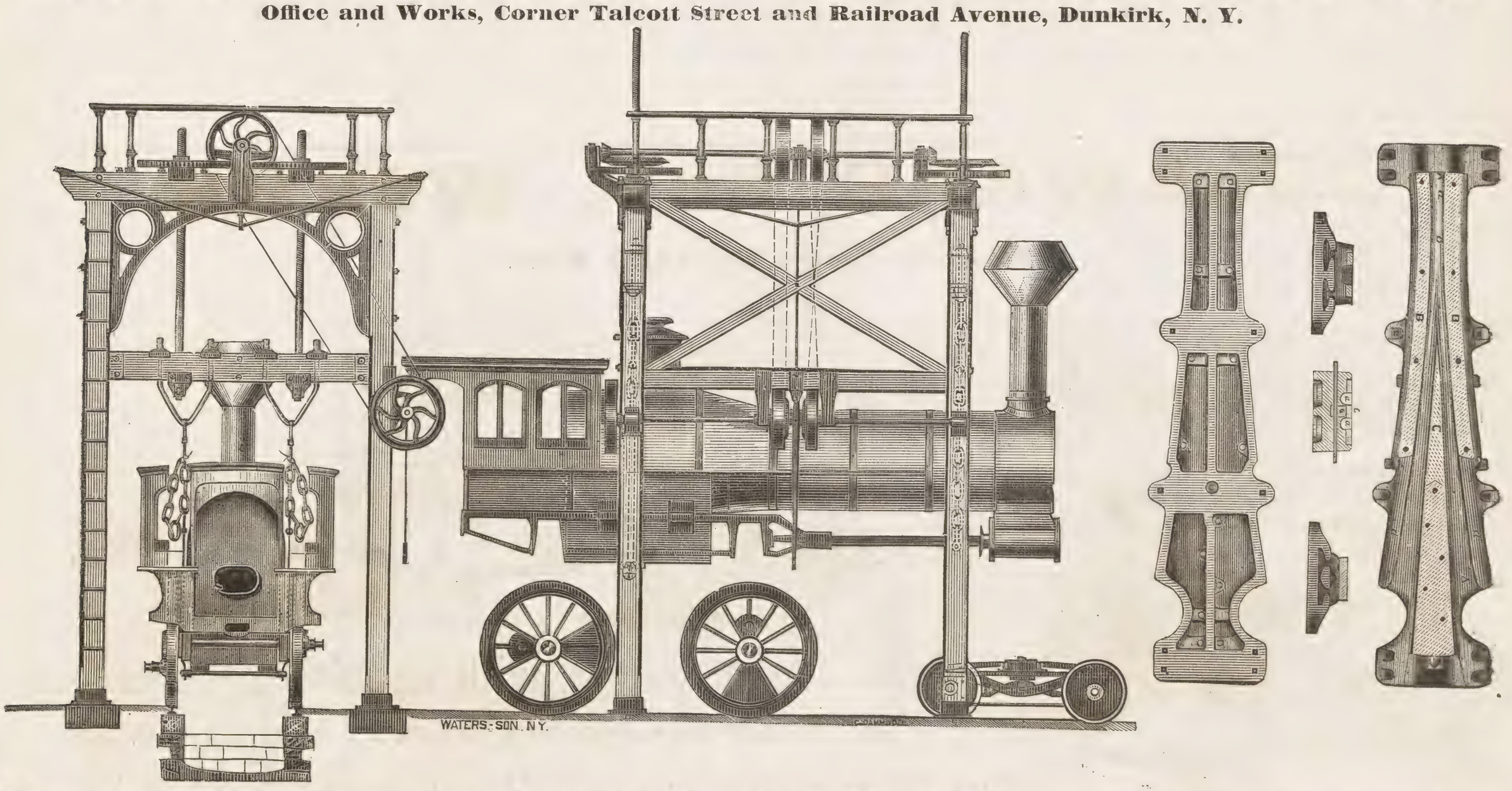
Office and Works, Corner Talcott Street and Railroad Avenue, Dunkirk, N. Y.



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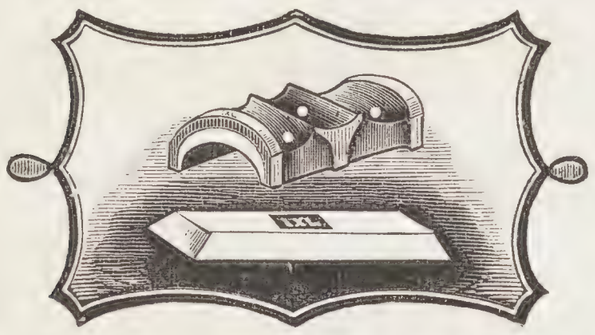

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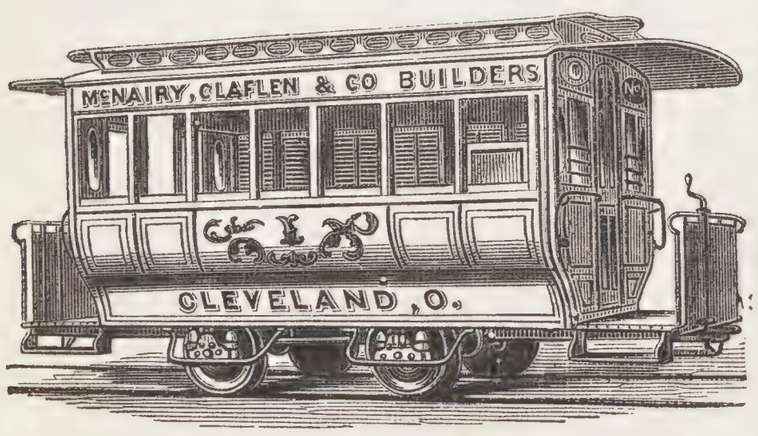

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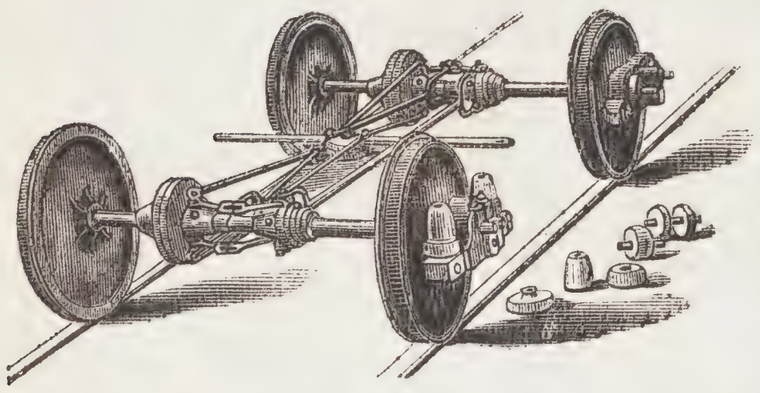

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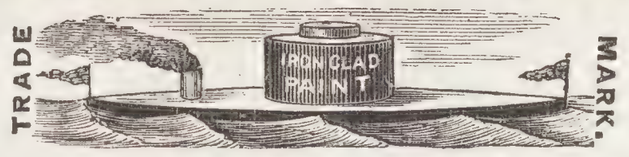

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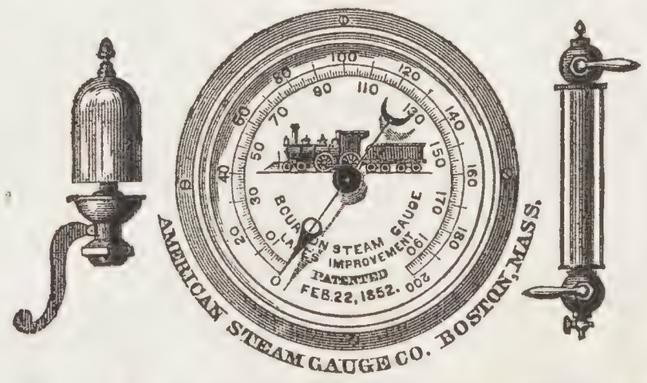

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IT IS IN DAILY USE ON OVER

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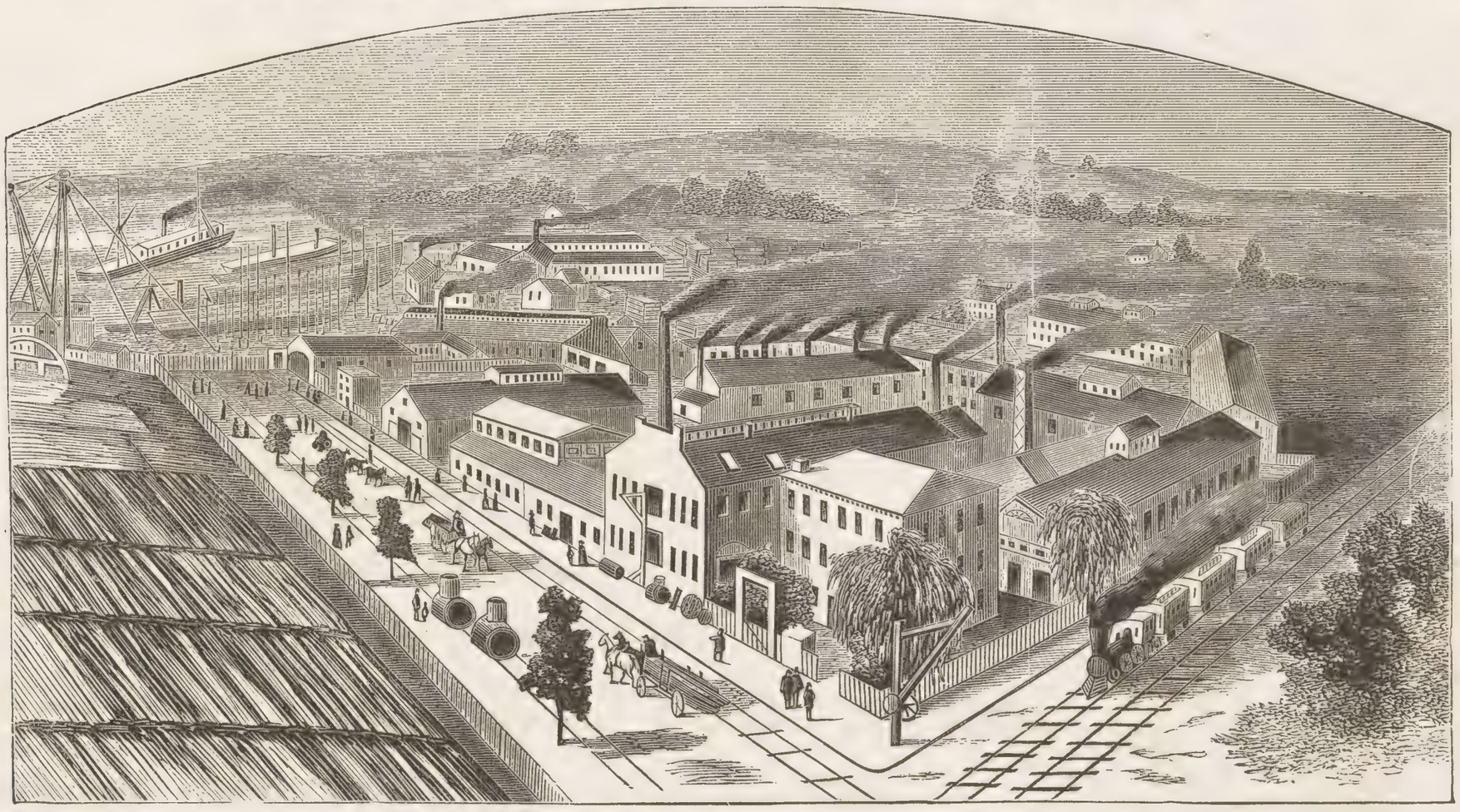

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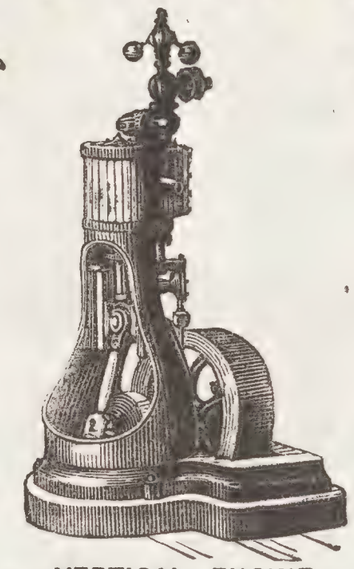
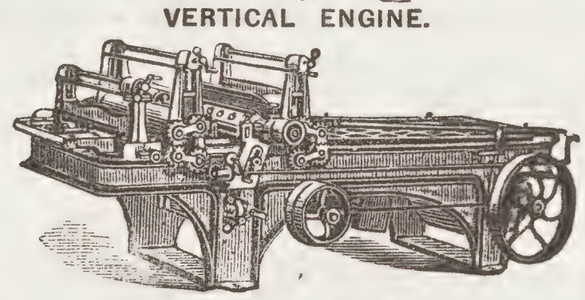
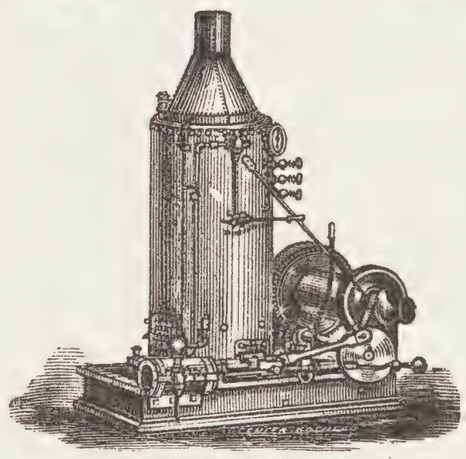


VERTICAL ENGINE.



WOODWORTH PLANER.



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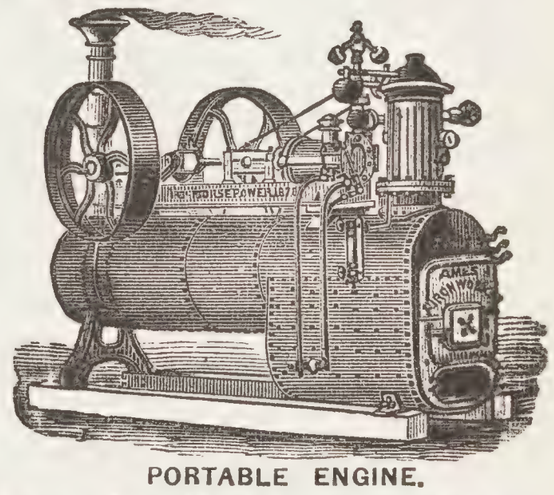

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THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. V. No. 3. | MARCH, 1874. | One Dollar per Annum. Single Copies, 10 Cents.

The Master Mechanics' Association. Committee-Circulars of Inquiry.

THE following circulars have been issued by committees of this association:

SAFETY-VALVES AND TESTS OF PRESSURE-GAUGES.

The undersigned, a Committee appointed at the last annual Convention of the American Railway Master-Mechanics' Association, to report on the "Best Form of Safety-Valve or Method of Relieving Boilers of Over-pressure, and the Best Way of Testing Pressure-Gauges," invite your attention to the following questions, and respectfully request you to reply to the same.

1. From your experience, what do you consider the best method of attaching safety-valves to locomotive boilers?
2. What are your objections, if any, to lever safety-valves?
3. What are the advantages or disadvantages of direct-action spring safety-valves?
4. Do you find any detriment to boilers or any injurious lifting of water from the use of the Richardson direct-action or "pop" valve?
5. What do you advise as a minimum diameter of valve, where two are used, on coal-burning boilers of the common 16 x 24 inch cylinder engines, with, say, a grate-surface of 14 square feet?
6. Have you any improvement or modification of the Richardson valve in use? and, if so, will you send drawing or description of same?
7. What is your method of testing pressure-gauges?
8. Do you test your locomotive gauges at regular intervals, or only when reported by the engineers?
9. State the name of the maker whose gauges give you best satisfaction, and state the advantages of the same.

Replies should be addressed to CHARLES R. PEDDLE, Chairman of the Committee, St. L., V. & T. H. R.R., Terre Haute, Indiana.

CHARLES R. PEDDLE,
W. F. RAY,
S. KEELER,
} *Committee.*

CONTINUOUS TRAIN-BRAKES.

The Committee appointed by the American Railway Master Mechanics' Association at its last annual meeting, to report on the subject of "Continuous Train-Brakes," would respectfully solicit your opinion and answers to the following questions, and desire that you will make them as full and comprehensive as possible upon this subject, as it is one of much importance to the railroad interests of the country. The value of our conclusions will depend almost entirely upon the facts and correct opinions furnished the Committee, and from which they will be obliged to obtain the material for their report

Please reply previous to the 20th of March, 1874.

1. In your opinion, what are the requirements in a power-brake to produce the best results, and necessary to accomplish the end desired in the most perfect manner?
2. Are you using a continuous brake on the equipment on your road? If so, what kind, and by what name is it known?
3. Is it efficient and reliable under all ordinary circumstances; and in its action and results is it all that is to be desired? Do you know of instances where, in your opinion, the use of this brake has been the means of saving life and preventing serious destruction of property? If so, please relate the circumstances.
4. Will the brake you describe remain set on all the cars after being applied, even if the train should become severed by accident?
5. Do you consider the feature referred to in the fourth question a matter of vital importance, as a means of preventing—at least in many cases—serious results in the destruction and injury that so frequently attend accidents of this character?
6. Do you know of any brake that will apply automatically in case the train should become severed or any part of it thrown from the track? If so, please give a description of the device.
7. Do you consider a brake having the above automatic attributes of sufficient value and importance to warrant its general adoption?
8. Have you in use, or a knowledge of, a power-brake applied to the driving-wheels of locomotives? If so, give a description of the same, and your opinion as to its merits, with your reasons therefor, for or against such application of braking power.
9. In your experience, is the brake, when thus applied to the driving-wheels, found to be destructive or injurious to the several parts of the locomotive affected thereby?
10. If found to be injurious, what proportion does such extra wear and the cost of repairs bear to the benefits derived therefrom?
11. If the application of brakes to the driving-wheels of locomotives hauling passenger-trains is desirable, would the results, in your opinion, be equally beneficial if applied to those hauling freight and other trains, and those doing switching service?
12. In your opinion, can a road be as safely and economically operated, all things considered, by the use of hand-brakes, or a similar braking power, as by the use of a good system of continuous brakes; and will not the advantages derived from their use more than compensate for their original cost and maintenance in good and perfect condition thereafter?

Replies are to be addressed to R. WELLS, chairman of Committee, J. M. & I. R.R., Jeffersonville, Indiana.

R. WELLS,
L. H. WAUGH,
E. B. GIBBS,
} *Committee.*

STEEL TIRES, WHEELS, AND AXLES.

The undersigned, a Committee of the American Railway Master Mechanics' Association, to whom was referred the subject of "Steel Tires, Wheels, and Axles, also Chilled Tires," respectfully call your attention to the accompanying series of questions, and solicit such information as you may be able to furnish on the topics therein embraced.

It is obvious that, to enable the Committee to present a report which shall possess any real value, they need to have before them statements from as many sources as possible, and that these be as full and accurate as practicable.

The Committee hope you will promptly favor them with replies to their interrogatories, as complete and definite as possible. In respect to circumstances of breakage or removal of tire, they especially desire full information.

As it is desirable that the details of the performance of tires, etc., should be brought up to a uniform date, we suggest the first of March as that date, and hope to receive the reports during that month.

Questions Relating to Steel Tires.

1. How many steel tires, and of what manufacture, are in use on your road?
2. Please furnish a detailed report of the performance of each set, stating the maker's name, the number of the set, thickness when fitted for use, number of times turned, present thickness, mileage, diameter of wheel, weight of engine; also weight on drivers and nature of service.
3. Have any steel tires broke while in use on your road?
4. Please furnish statement of circumstances attendant upon such breakage: as, the season of the year, the mode in which the tire was secured, the amount of shrinkage when set, the nature of the fracture, and extent of the damage in consequence thereof.
5. Have any steel tires on your road been removed from wheels, on account of being worn so thin as to be considered unsafe? If so, of what thickness were said tires when removed, and what indications caused you to doubt their safety?
6. Is the location of your road such as to make your tire-service particularly severe, on account of heavy grades or extremely cold weather?
7. What do you consider the best method of fastening steel tires to the wheels, and what rate of shrinkage do you allow in setting?

Chilled Tires.

8. How many chilled tires, and of what manufacture, have you in use on your road?
9. Please furnish detailed report of the performance of each set, mileage, diameter of wheel, weight of engine, and nature of service.

Wheels.

10. How many steel wheels, and of what manufacture, are in use on your road, under engines or cars?
11. In your experience, how do steel wheels compare with those of iron, in point of durability, safety, and economy?

Axles.

12. How many steel axles, and of what manufacture, are in use on your road, under engines or cars?
13. From your own experience, do you think that their greater durability and safety, as compared with those of iron, would justify the difference in cost?

Replies to be addressed to the chairman of committee, JAMES N. LAUDER, Northern R.R., Concord, N. Hampshire.

J. N. LAUDER,
F. A. WAITE,
ALBERT GRIGGS,
} *Committee.*

SUPPLYING WATER TO TANKS.

The undersigned, a Committee appointed at the last annual Convention of the American Railway Master Mechanics' Association, to report upon the subject of "Machinery for Supplying Water to Tanks, Giving Description of Engine, Windmill or Device, with Cost of Working the Same," beg leave to call your attention to the following questions, and solicit an early reply to the same:

1. What arrangements have you for supplying water to tanks at water stations on the line of your road?
2. Please give description of engine, steam-pump, windmill, horse-power, or other device employed for the purpose, the number of gallons raised per day, or for each twenty-four hours, and the cost for working the same; or, if the tanks are supplied by a natural fall, describe the kind of pipes used to convey the water, and the best method of putting them down; the kind of bulkhead or dam at the fountain, and best method of keeping the strainer from being choked up or damaged from driftwood, etc.; also describe the means of protection you have found most effectual in frosty weather for pipes under ground or otherwise situated, and for tanks in open air and machinery in buildings.
3. Describe what arrangements you have for delivering water from tanks to the tenders, and state whether it can be practically kept free from leakage and safe during frosty weather.

4. Describe the best method you are familiar with for supplying water to tanks.

5. In your description give, as far as convenient, drawings or sketches of the parts you describe; and, where practicable, statements of the cost of the work.

Replies should be addressed to the chairman, J. L. WHITE, E. and C. R.R., Evansville, Indiana.

J. L. WHITE,
J. H. FLYNN,
HOWARD FRY, } *Committee.*

NARROW AND BROAD-GAUGE ROLLING STOCK.

The Committee appointed at the last meeting of the American Railway Master Mechanics' Association, on the subject of "Narrow and Broad-Gauge Rolling Stock," beg leave to request your answers to the following questions:

1. What is the gauge of your road?

2. What is the diameter of cylinders, length of stroke, number and diameter of driving and truck wheels, weight on driving wheels and gross weight of each class of engine on your road?

3. What is the gross load hauled by each class of engine (including engine and tender), pressure of steam, points of cut-off, grades, curves, speed in miles per hour, also the dead weight carried per ton of paying weight in each case? Give, also, the kind of tires—plain or flanged—and their position on the engines.

4. What is the weight of each class of freight-cars (four and eight-wheeled) and the loads they actually carry? Give weights and loads carried by each class.

5. Give also the cost of repairs of engines per mile.

Replies should be addressed to W. S. HUDSON, chairman of committee, Rogers Locomotive Works, Paterson, New Jersey.

W. S. HUDSON,
J. A. DURGIN,
H. N. SPRAGUE, } *Committee.*

The Master Car-Builders' Association.

THE following circulars of inquiry, addressed to master car-builders and foremen of railway-car shops, have been issued by the committees of this association. The information asked for is to enable the respective committees to prepare their reports for the next annual meeting.

DRAW-BARS AND BUFFERS.

1st.—What kind of a draw-bar do you use on your road?

2d.—What kind of buffer or dead-wood would you recommend?

3d.—Do you approve of the old style of buffer where blocks are on a timber over the draw-bar?

4th.—Which do you think the best to use on freight-cars, cast or wrought-iron draw-bars?

5th.—Would you have the dead-woods meet before the springs in draw-bars are exhausted?

6th.—Would you advise the use of a self-coupling draw-bar?

7th.—Do you know of one in successful use; if so, what road and whose make?

8th.—Do you think a self-coupling draw-bar would lessen accidents if used?

9th.—Do you think it would be advantageous to adopt a uniform draw-bar for all roads; if so, what kind would you recommend, and how attached to the car?

10th.—Please give us your ideas in your own way, and illustrate them if possible by drawings on this whole subject.

11th.—Have you had in use on your road, at any time, a self-coupling draw-bar; if so, what was the result of trial?

12th.—What is the comparative breakage between wrought and cast-iron draw-bars?

13th.—What is the comparative expense of keeping in repair wrought and cast-iron draw-bars?

All replies should be addressed to the chairman of the committee, F. D. ADAMS, Boston and Albany R.R., Springfield, Mass.

F. D. ADAMS,
C. A. SMITH,
JOSEPH JONES, } *Committee.*

CAR-BODIES.

The committee, which is instructed to report on the most suitable size (length, width, and height) of car-bodies; the best manner of framing and putting together; the most suitable size and kind of lumber to be used for the same, ask replies to the following questions:

Freight-Cars.

1st.—What length should a freight-car body be built to carry general merchandise?

2d.—What width should the same be built?

3d.—What height from top of floor to under edge of plate?

4th.—The strongest and most durable manner of construction?

5th.—The size of bottom timbers, the size of end-plates, size of door and corner posts, of intermediate posts, braces and carlines, and side-plates?

6th.—The best kind of material for framework?

7th.—The best kind of material for flooring and siding, and the thickness of each?

And any other suggestions that you may please to make to assist the committee in making a full report.

"Your committee are fully impressed with *the importance of a properly built* freight-car, combining strength, durability, and *uniformity upon all of our respective* railroads—with so much interchanging of cars as we now have, and which must (in the opinion of your committee) be extended. And we *know* that the only *way* that the *information sought* can be obtained is from the *experience* of the respective MASTER CAR-BUILDERS; and we, your committee, do therefore very respectfully ask that you will give us your opinions upon the subject referred to, with any sketch or tracing that you may please to send us."

Passenger-Cars.

1st.—What size passenger-car bodies, and how many passengers should each car seat, in view of economy to build and keep in repair, and for safety on four-wheeled truck?

2d.—Is there any advantage in making the sills in two pieces in place of one, and the car so framed as to admit of a circulation of air, from the bottom, between the inside lining and the outside paneling?

3d.—Would such ventilation preserve the frame-work of the car from decay?

4th.—Can a car-body be put together in a way as to give circulation of air between inside and outside lining of cars, and at the same time be built sufficiently strong to give safety and durability (in ordinary sense) to the car?

Besides a reply to the foregoing questions, any suggestions will be thankfully received by the committee.

Replies should be addressed to the chairman, I. W. VAN HOUTEN, Pa. R.R., West-Philadelphia, Pa.

I. W. VAN HOUTEN,
C. A. SMITH,
SAMUEL CAMPBELL, } *Committee.*

CAR-ROOFS.

1st.—Do you use tin or other metal, or canvas, for the outside covering on passenger-car roofs? State quality of material used, and how applied.

2d.—Have you on your road what is known as the *double-board roof;* if so, how are they put on?

3d.—Have you any trouble in keeping them tight; if so, where do they fail, and how do you remedy the evil? Please give your experience and opinion of this roof as fully as possible.

4th.—Have you any of the *Winslow iron roofs* on your road? If so, state if you have any trouble in keeping them tight.

5th.—Have you any trouble in repairing them, when broken by accident?

6th.—Does the iron in these roofs rust out; if so, how soon after being put in service?

7th.—Would you recommend this roof for freight-cars; if so, why; if not, why?

Please give your experience and opinion of this Winslow roof as fully and clearly as possible.

8th.—Do you use tin on your freight-car-roofs; if so, what size and kind, and how applied; how many nails per sheet used, and at what points?

9th.—Do you have any trouble in keeping a tin roof tight; if so, where do they fail?

10th.—What would you recommend as the best material to paint wood and metal roofs?

Please furnish any other information on this subject that will aid the committee to make a *clear* and valuable report.

Replies to be addressed to chairman of committee, C. A. SMITH, 113 Liberty street, New-York City.

C. A. SMITH,
GEORGE HACKETT, } *Committee.*

APPLIANCES FOR REPLACING CARS ON TRACKS.

1st.—What means do you use to replace cars on track when in upright position with wheels off?

2d.—When thrown from track, and down on side, what is your mode of uprighting and replacing them?

3d.—When down an embankment, how do you raise them?

4th.—Can you suggest any plan to expedite the work of replacing cars on the track?

5th.—What tools and other devices would you recommend to be carried by trains for purposes named above?

Any other information, bearing upon the subject, not suggested by the above questions, will be cheerfully received by the committee. Address replies to the chairman, W. J. CALAIS, Wilmington, Columbia, and Augusta R.R., Wilmington, N. C.

W. J. CALAIS,
H. LONGEST,
J. N. KING, } *Committee.*

The Canada Car and Manufacturing Company.

THE works of this company are located at Toronto, and form a part of the new Central Prison established there by the Ontario Government, the design being to utilize convict labor by its employment in the manufacture of railway-cars. A formal opening of the works—which have been constructed within the past year—took place on the 7th ult. A large party of gentlemen participated in the proceedings, including a number of prominent railway and government officials. After making a complete inspection of the several shops and buildings, the party partook of a splendid banquet which had been prepared in one of the large show-rooms by the directors of the company. Toasts were drunk and speeches made, evincing the best feeling in regard to the advantages likely to accrue from the employment of free and prison labor in the building of cars.

Hon. A. McKellar, a member of the Ontario Legislature, said the enterprise would not interfere with the work of mechanics or tradesmen of Toronto. He held that the manufacture of any thing requiring the materials of wood and iron, could be done cheaper in Canada than in the United States, and that the establishment of these works would prevent thousands of dollars from going out of the Dominion annually.

Mr. Hugh Bains, the managing director of the Car Works, said that one of the objects of their establishment was to utilize labor that had hitherto been unprofitable to the country, by using it for building railroad cars so that railroad companies could get them quickly and cheaply, and of the best quality. A large amount of money had been expended by the company in workshops, grounds and heavy machinery. The capacity of the works, when in full operation, would be equal to the turning out of ten freight-cars per day completely finished, making nearly every thing from the raw material, and, as far as he knew, it would be the only works on the continent doing so. He expected the patronage of railroad companies which now built their own cars, because a car which would cost them $500 at their own shops, could be built at these works, and in every respect equally as good, for $400. The works were already executing orders for cars from the Great Western and other roads. The contract between the Car Company and the Government was for the advantage of both, but this could not have been brought about without a large outlay by the former. There was one thing which could be said of the company which he believed could not be said of any other company in the Dominion, and that was, it never had given away any shares either directly or indirectly to any one without par value being paid for them, nor had it promised any directly or indirectly, and when the first $250,000 of stock was subscribed it only cost for brokerage one half per cent. He had an order for samples of woodwork to be sent to England, and if the work was satisfactory, they would receive an order for the woodwork for several cars for English railway companies.

IN America and England, hand-saws have the teeth pointed from the handle, while in Asiatic countries and in Greece they are made with the teeth pointed the other way. The latter must be operated by pulling them; the former, by pushing. In delicate work, and where very fine small saws are used, the Eastern saw is best. The Orientals differ from us in setting the teeth of the saw also; they turn a group of a dozen one way, and the next group the other, while we alternate one on one side, the next on the other.

THE Allegan Car Company's stockholders held a meeting recently at Allegan, Mich., and resolved to finish up the shops and put in the machinery at once, and then to commence the manufacture of cars.

THE Midland Railway of England contemplates adopting the American plan of checking luggage, and thus saving passengers all anxiety about its safe keeping.

Dr. Allen's Method of Car-Ventilation.

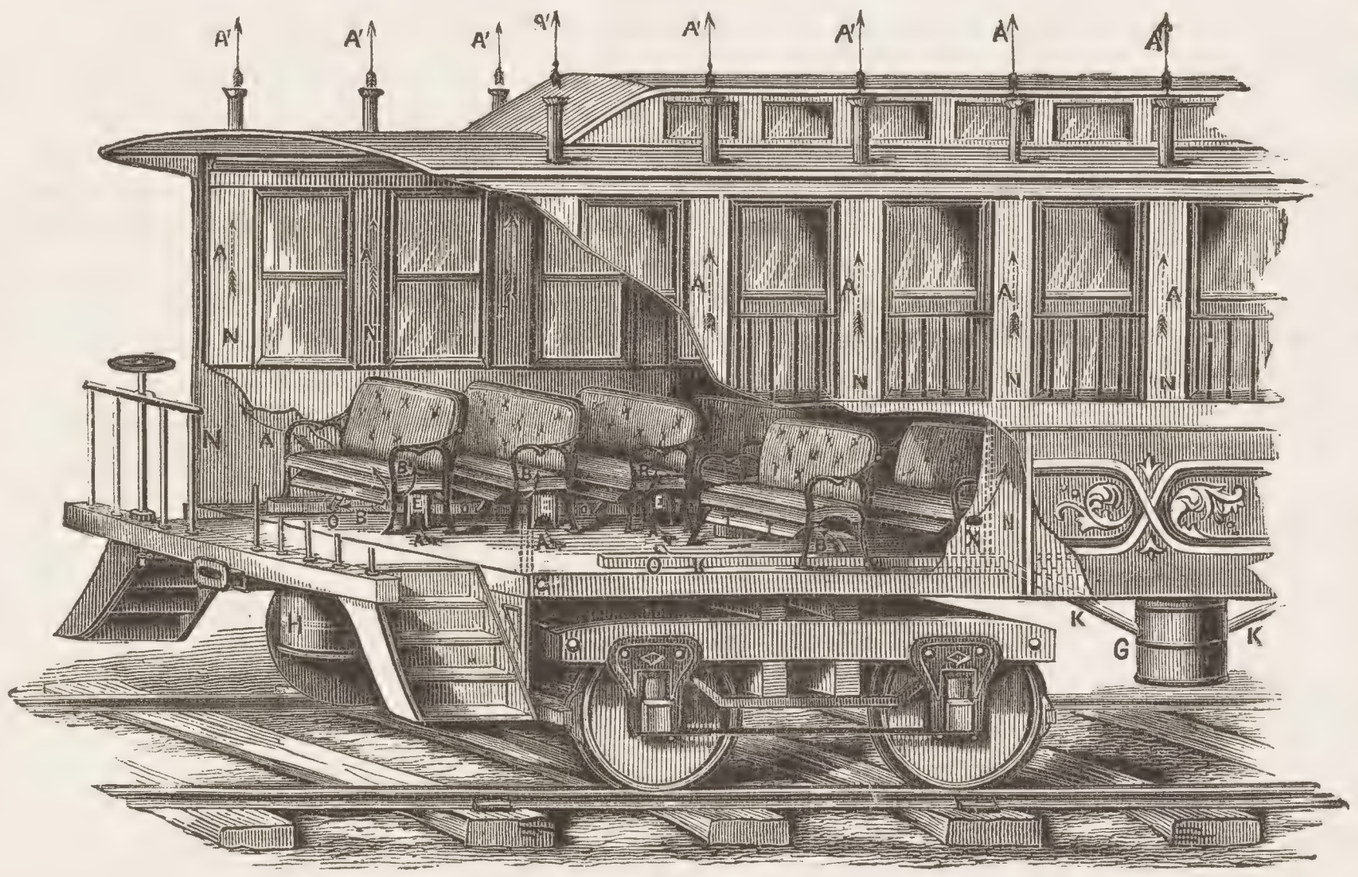
THE engravings illustrate the method of ventilating passenger-cars, invented and patented by Dr. J. G. Allen, of Philadelphia, and which is said to be in successful operation on the Philadelphia and Baltimore Central Railroad. The original design of the inventor comprises a stove or heater underneath the car, as shown in the cuts; but his method has been applied, on some of the cars on the above road, in connection with the later improvements of the Spear stove, which it is said are very much improved thereby. The inventor also considers his method equally applicable to the Baker steam-heating apparatus, alleging that it will effectually remove the objections, with respect to ventilation, which have been raised against that system.

The leading feature of Dr. Allen's plan consists in the ventilation of the car entirely from the bottom or near the floor, where the strata of impure air accumulates. The warmed air is let into the car at numerous places, so as to be evenly distributed; and as the exhaust-holes E are at the end of the seats next the aisle, the colder bottom-air is constantly drawn away without producing a current that will cause discomfort to passengers, as the exhaust air is always drawn from the aisle and replaced by the warmer air above. This method is said to be so effective in its working, that it is capable of changing the entire volume of air in a car in the short space of three minutes.

Fig. 1 shows the arrangement as it is applied to new cars. The arrows A over the roof and along the sides, indicate the direction and course of the impure air through the exhaust-flues beginning under the seats at E and passing under the seat-cushion to the vertical passages in the car-wall at N, from which it escapes at the top. The hot air may be introduced at one or more places near the floor, and from any kind of heater, but preferably from one under the platform at H, or under the car-body at G, from whence it may be conducted by a flue, as at K, with openings under each seat, as at O, directing it into an inverted trough T, from which it is gradually spilled into the car as indicated by the arrows B. Fig. 2 shows the application of the plan to old cars, there being but one exhaust vertical flue at each end of the car, and communicating with those under the seats by means of side-flues running along the bottom. This method can also be applied to new cars if preferred.

As illustrating the comparative advantages of this plan of ventilation, some experiments have recently been made on the cars of the above-named road, which show the different degrees of temperature at different heights in the car. Five thermometers were used; one on the floor, one on the seat, one at height of passenger's head, sitting; one at height of head, standing; and one at top of dome.

Fig. 1.



First experiment, January 31st. Car heated in the usual way with two stoves; usual top ventilation. External temperature, 18° Fahrenheit. The following was the result:

Temperature at top of dome,	92°
" " height of head, standing,	79°
" " height of head, sitting,	75°
" on car-seat,	43°
" on car-floor,	32° to 36°
Difference between floor and dome,	56° to 60°
" " floor and head, sitting,	39° to 43°

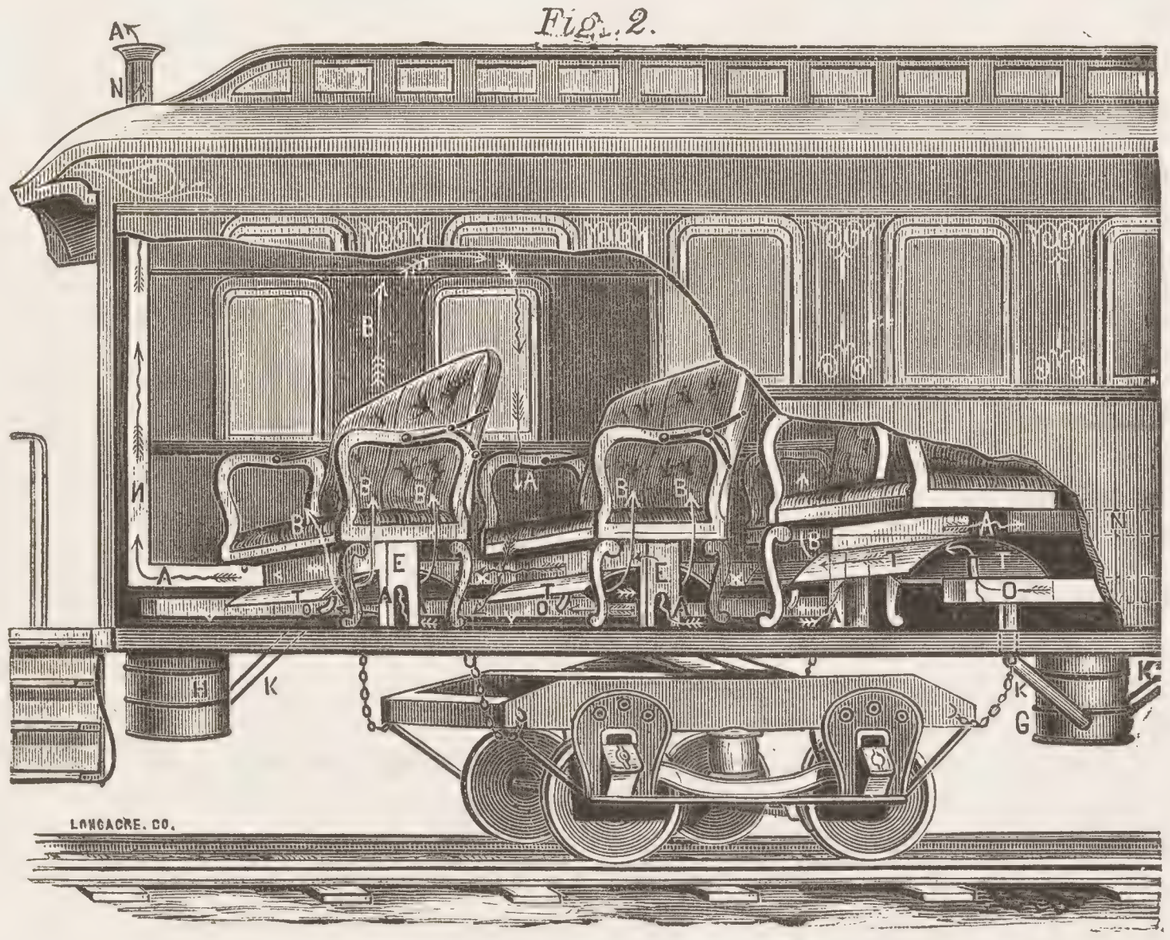
Another experiment at the same time, on another train, with car heated by stoves underneath, and equipped with Allen's ventilator, showed the following result:

Temperature at top of dome,	79°
" " height of head, standing,	74°
" " height of head, sitting,	72°
" on car-seat,	69°
" on car-floor,	67°
Difference between floor and dome,	12°
" " floor and head, sitting,	5°

Another trial was made in February on same road; car with usual top ventilation, and heated with two stoves. External temperature, 25°.

Temperature at top of dome,	86°
" " height of head, standing,	70°
" " height of head, sitting,	66°
" on car-seat,	50°
" on car-floor,	40°
Difference between floor and dome,	46°
" " floor and head, sitting,	26°

Fig. 2.



Another car at the same time and with the same train, equipped with Allen's heater and ventilator, gave the following result:

Temperature at top of dome,	78°
" " height of head, standing,	74°
" " height of head, sitting,	71°
" on car-seat,	69°
" on car-floor,	67°
Difference between floor and dome,	11°
" " floor and head, sitting,	4°

This was an accommodation train stopping every mile. Soon after, when a point was reached where a steady run was made of 5 miles in about 15 minutes the following change took place:

Temperature at top of dome,	74°
" " height of head, standing,	72°
" " height of head, sitting,	70°
" on car-seat,	68°
" on car-floor,	67°
Difference between floor and dome,	7°
" " floor and head, sitting,	3°

These results show a uniformity of temperature rarely if ever experienced in winter on cars heated and ventilated in the ordinary way, and this is as good a recommendation of Dr. Allen's method as it could well have. It is, we are informed, strongly indorsed by the officers of the Philadelphia and Baltimore Railroad, and also by the committee on Arts and Sciences of the Franklin Institute of Philadelphia.

THE highest point in the world, where railways are now in operation, is at Apizaco, on the Vera Cruz and Mexico Railway, 7478 feet above the level of the sea. The next highest is on the Central Pacific, in the Nevada range, 7111 feet above the level of the sea. The third is at Arequipa, an important city in Peru, 7000 feet above the level of the sea, and, under the Peruvian railway system, the work is to be continued, and is expected to reach double that altitude. It sets out upon an ascent, to pass to the west of the Eastern Cordilleras, and puts itself thus in connection with the famous lake of Titicaca and the entire Andine Bolivia, also with the great historic realm of the Incas, the ancient capital of Cuzco, and must reach a point at the breath-taking height of 14,000 feet above the level of the sea—less than 4000 lower than the crater of Popocatapetl, and 6000 higher than the city of Mexico.

THE Railroad Commission of Massachusetts have codified all the laws of the State relating to railroads into one Act of 167 sections, to be known as the "General Railroad Act." The Springfield *Republican* notices with satisfaction that the commission cling to the word "railroad," which is certainly just as good as the English word "railway." Nor do they, as some reporters do, affect the verb "shunt" for switch, or "luggage" for baggage. They call the street institution a "street railway," for which, as it occupies part of a "road," there is perhaps some ground. The laws affecting street railways were codified in 1871 and do not appear in this bill.

THE Watson Manufacturing Company, at Paterson, N. J., has completed during the past month, twenty spans of seventy-six feet each, for a bridge over the Rio de Chicama, in Peru. Ten spans remain to be built. The shops have work enough on hand to keep a full force employed for two months to come.

THE Ridgeway Iron Works, at Youngstown, O., have been improved by the addition of a new 175 horse-power engine and some new tools, and will shortly resume work. The capacity of the works is now 125 tons of finished rails per day of twenty-four hours.

The One-Track Railway.

A CORRESPONDENT of *The Iron Age* writes as follows concerning the prismoidal one-track railway, invented by Mr. E. Crew, of Opelika, Alabama:

At the invitation of the agents of the patentee, Messrs. George W. Grice & Co., I lately visited the Chestnut-street (Philadelphia) Skating-Rink, to witness a trial of the system. The track erected is of elliptical form, 450 feet in length, and elevated nine feet from the ground: the curves being of 37½ feet radius, or, of course, smaller than is possible on a double railroad. The railway is, as the title indicates, a prism, having a base width of 24 inches, with a height of 14 inches to the apex of the cone, which is shod with a crescent shaped rail weighing 18 pounds to the yard, the surface of the prism presenting an angle of 45 deg. This prism is built up of one-inch boards placed vertically, and contains no stronger fastening than that afforded by common tenpenny nails. This form of lumber has been adopted as lightest, most easily handled, and presenting on the surface of the prism, by the lap of the boards, a better opportunity for coating the surface with concrete, paint, or other material to prevent water entering, and to form a smooth and even prismoidal shape. This is set on posts 8 feet high by 12 inches square. So much for the track.

The locomotive, which weighs four tons, was built at Gloucester, N. J., and at first sight resembles an ordinary narrow gauge or mine locomotive, but on examination proves to be an adaptation of the bicycle to a rail track. The machinery, boiler, tank, and cab present no unusual features except in the drivers, and what the inventor calls "base wheels." The drivers, two in number, are placed directly under the centre of the engine, one near the front end and the other under the foot board of the locomotive, and have grooved tires fitting loosely on the crescent-shaped rail. From each side of the locomotive extend downward triangular frames, bearing at the apex of the triangle elongated cylinders or wheels, which engage the sides of the prism at the angle of the surface and just touching it. Herein lies the secret of the whole thing; these wheels serving to retain the machine on the track while the drivers propel it. Any lateral inclination, less of which was indeed perceptible than in an ordinary locomotive under headway, is immediately checked by these side base-wheels. At the request of the inventor, I rode round the circle several times in the locomotive, and the motion in the cab was quite as slight as in a Pullman car on a steel rail. No grinding or friction was perceptible in going round the short curves, and on the bicycle principle, the faster the gait the steadier the machine ran. A speed of twelve miles an hour is only attainable with this special engine on this 450 feet of track; with a straight track the engineer expressed the opinion he could run this engine, with two feet drivers, at the rate of twenty miles per hour. He further stated that after an experience of thirty years as a locomotive engineer, he had never found an engine so easily controlled. In coming round the last time, steam was shut off, and the engine turned the curves without any halt or jerking motion. Examination of the sides of the prism showed that there is no great friction from the base wheels, as the wood, in this case not yet covered with concrete, showed no abrasion, and, in fact, less wear than the rail. The locomotive here in use is intended for an elevated street railway in Atlanta Georgia, and the inventor has had cars running for some time in Opelika, Ala.

The advantages claimed for this system are as follows, and the subject possesses numerous points for the careful investigation of all interested in the transportation of freight and passengers by rail:

1. The cost of construction of one mile of railway, including equipment, by this system is not to exceed one third that of the ordinary road.

2. The weight to be pulled by the engine or borne by the roadway is in this case, compared to the ordinary system, as one to three.

3. The danger of derailment is reduced to a minimum. The locomotive is so built that in case of meeting an obstacle lying across the track, it is struck and knocked off, or the train is stopped by the concussion.

4. The prismoidal form of the track materially lessens the danger of accidents from collisions or running over persons or cattle on the track, since the shape repels rather than invites travel, and at the same time offers much less space for the accumulation of snow as an obstruction.

5. Higher rates of speed may be attained with a given power on account of reduced friction. The objections which at first sight suggest themselves are all easily overcome. Thus, how can you switch with this engine? The reply is furnished by a model, which shows not only the simplicity of the operation, but that it affords the desideratum of railway men, the entire avoidance of the use of a frog. A continuous rail is given, which no double-rail system can possess in switching

The danger of upsetting from high winds is obviated from the shape of the engine and car, which show that any lateral force exerted against it but serves to press it down and on to the track. The cars, having the greater portion of the weight below the centre, and the passengers sitting only eighteen inches above the rail, must necessarily ride more easily than by the ordinary system.

The engine now in use will shortly be supplied with a car, when this can be demonstrated. The system as demonstrated here has been examined by numerous railway officials, all of whom have expressed themselves satisfied with its practicability and value, and, further, that by its adoption between here and New-York the time of transit could be reduced one half. For street railways, upon the elevated plan, it would seem to supply precisely the want so long expressed, for cheap and rapid travel. Upon the general principle that no road or street should cross a track at grade, this system would require elevation of road or track; but in case of crossing railroads of its own or the normal system, an arrangement has been made by which this can be done with ease and safety.

This system was examined by the writer in the interest of a coal company proposing to build five miles of road, and for this purpose, as for ore or construction companies, it clearly possesses many advantages. The form of coal or ore-car for this road is perforce a *self-dumper*, the interior of the car sloping on each side at the angles of the prism. For such roads, or in new countries, it offers the cheapest form of the wooden railway possible, requiring no material but lumber and nails or pins; while hewn timber, even, can be used, and wooden wheels which any ordinary carpenter could make. The cost is not to exceed $3000 per mile, as here demonstrated, and the saving in construction of bridges, trestle-work, and the like is, of course, marked.

Cheap Transportation Schemes.

THE various schemes for facilitating and directing transportation that have engaged and will engage the attention of Congress, are varied in detail as they are numerous. The inspiration of most of them seems to be a desire to appease the "hay seed" politicians. We say this because they all proceed on the supposition that the railroads are "arrant cheats," that they are the apostles of a new evangel whose mission to the world is to right the wrongs that corn and wheat have suffered from the extortions of these monopolists. That there is a good deal of cause for complaint we do not deny.

But while we concede this, we are of that class, that seems to be growing smaller every day, that believe that railroads have some rights which the average American citizen is bound to respect. We do not believe that they are legitimate game for every bungling demagogue to shoot his little popgun at, to tickle his constituents with the noise. Armed with tin sword and three-cornered paper hat, they valiantly lead their forces to the attack, in a braggart style, and with all the flourish of a boy "showing off."

We do not desire to be misunderstood. We do not assume to be the champion of the railroads. We confess they are at times extortionate, unjust, discriminating; but they have rights, and in the main have served the public well. They have opened up regions of the country that otherwise would be wilderness still. Take away the Illinois Central, the Chicago and Northwestern, the Cleveland, Burlington, and Quincy, and the Pittsburg, Fort Wayne, and Chicago from Illinois, and the three trunk lines that cross Iowa, and what would the population of these States be and what the value of their lands? It is no doubt unfortunate for them that they are so far from a market, but that is their own fault. In the first place, they moved of their own will to these States, leaving the markets behind them, and decreasing their prospective gains with each mile traveled; and in the second place, they have failed to encourage the creation of a home market, but have often discouraged it.

We oftentimes fail to see the justice of much of the vituperation heaped upon the railroads. If farmers do not get a price that they desire for their corn or wheat, no matter how large the crop may be or how far they may be from market, they at once turn upon the railroads through the columns of the press, yell "Brimstone beast," and proceed in real earnest style to shake them up. In a word, the farmers of this country seem to think that their corn and wheat has a birthright to transportation to the ends of the earth, at a cost that shall leave them a living, and the item of cost to the railroads does not for a moment weigh with them. They might as well try to legislate gold into existence as to extinguish the actual cost of transportation, which beyond a certain distance must always be a barrier to the movement of the unaltered crude products of the farm. Railroads and canals unnumbered will not remedy this, for there is cost, and if the product is carried far enough it will eat up the material carried. Had these producers diversified their industries, then, with a market at their own doors, they might laugh at railroads, and instead of shipping crude bulky products, would send the less bulky and weighty manufactured article. Take Illinois for example, a vast State almost wholly arable. The very railroads its farmers now curse, have, within a generation, settled, developed, and organized the whole State. It produces corn by the hundreds of millions of bushels a year, indeed nearly 1000 millions. What can become of such a vast territory devoted almost wholly to agriculture, with a productive soil and 1000 miles inland? Why, it must diversify its industry, or ferment and rot. It is fighting against natural laws just when their manifestation is under the conditions that are strongest on the side of protection for, and development of, diversified home industry, and the nation that does that must perish. Diversified industry is the remedy for the farmers, not $175,000,000 railroads with bonds guaranteed, or even the interest of the same, by government. The people are being betrayed to suffering and ruin by the demagoguism that seeks to cure their evils as above stated by new roads. It is useless to make railroads the scapegoat of evils, and of a condition of things that fifty roads could not cure, and it is criminal to neglect to examine and consider facts so as to enlighten and direct opinion conscientiously.—*American Manufacturer.*

THE narrow-gauge railroad from Leavenworth to Holton is to be pushed on to Denver by a number of English capitalists. The success of the Denver and Rio Grande road has led to this step.

A ROCK ISLAND commercial traveler got his cheek damaged in a railroad accident over in Iowa, and had to quit work. No commercial traveler can do business while his cheek is out of order.

Lake Shore and Tuscarawas Valley Railroad Journal-Box and Bearing.

THE diagrams represent in general outline a journal-box and bearing now in use on the Lake Shore and Tuscarawas Valley Railroad. This road was among the first to adopt the standard-axle recommended by the Master Car-Builders' Association, but as there was no standard journal-box agreed upon at the Boston meeting, the master car-builder of the road, Mr. J. D. McIlwain, designed the one which we illustrate, for use on cars he was then building, and which in its general features does not differ very materially from the box which has since been adopted by the committee on the subject. The previous experience of the road in the matter of bearing-keys not being very satisfactory, the master car-builder was directed to dispense with them, and believing also that the committee appointed to prepare a standard box did not favor their use.

The drawings are to a scale of 3 inches to a foot. Fig. 1 is a longitudinal section of box and journal; Fig. 2 is a front view and cross section of same; Fig. 3 a top view and horizontal section; Fig. 4 a side view of brass; Fig. 5 end view of same; Fig. 6 a plan of same. The box-cap or cover is smooth and neatly fitting, and works with a hinge, which is deemed better than the plan of fastening with bolts. On the under side is a spring which works over the ear of the box with a bearing on the box that keeps the cap securely in place whether open or closed. The lower front edge of the box is rounded, to prevent the packing from working forward from under the journal. The bearing, instead of having a groove in the top of the brass clear across, as saddle bearings usually have, has a central recess, 2 inches wide by $2\frac{1}{4}$ long, and $\frac{1}{4}$ inch in depth, as shown in Fig. 6. Over this recess, and on the under side of the top plate of box, is a lug $1\frac{7}{8}$ inches in diameter and $\frac{1}{4}$ inch projection, corresponding to depth of recess into which it sets. The lug being perfectly round, allows $\frac{1}{8}$ inch play to the brass on each side, $\frac{3}{16}$ being the difference between length of recess in brass and lug on box, affording $\frac{1}{16}$ for variation in casting. Between the brass and top plate of box is a bearing surface of 3 x 4 inches. The iron, however, does not wear the brasses as might be supposed, as they appear, on examination after service, to be as good as when put in.

In order that the brass may be easily taken out, its bearing radius, when cast, is the same as that of the collar; it is then put in the boring-mill, and a surface 2 inches wide bored out, with a radius corresponding to curve of journal. A space of $\frac{5}{8}$ of an inch is left between the back of box and the neck of axle on the under side, this being sufficient to let the brass out without trouble. It will be seen that, at one point, the centre of side of bearing touches the box, as seen in Fig. 3. At any reasonable variation in the position of the box, the brass will have a true bearing, this being the principal advantage claimed for this style of box; while another important point is the doing away with the key, which at best is always a source of trouble, like box-caps that are screwed on or bolted. To keep the oil from escaping at the back end of box, a wooden collar is provided, as shown in Fig. 1, and which fits close to the axle. It is $\frac{5}{8}$ in. short at the bottom, to allow a clear movement when the box is jacked up for the purpose of taking out the brass. A wooden plug or wedge is driven in at the top to exclude dirt. The style of cap above described has so far worked well during a year's service, only 15 out of 4000 having been renewed. About 1200 of these boxes have been in use for six months on the above-named road, and have given such entire satisfaction that the company could not be induced to exchange them for any other.

Weight of box (bearing included), $62\frac{1}{2}$ lbs.; weight of bearing alone, $7\frac{1}{2}$ lbs. Neither the box nor any part of it is patented.

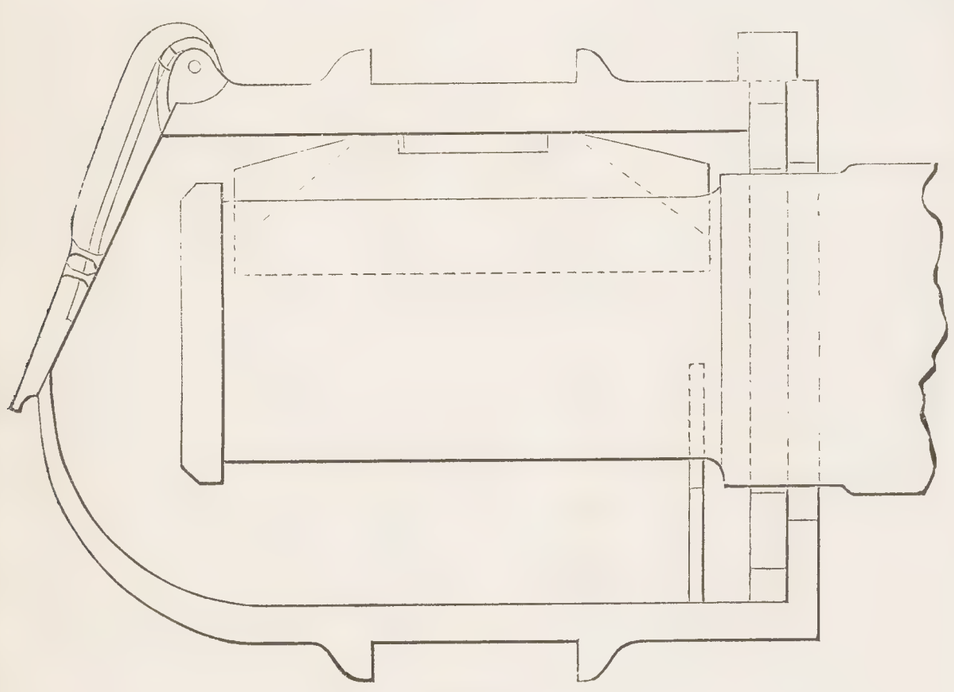


Fig. 1.

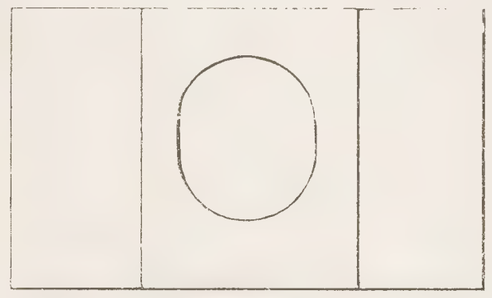


Fig. 6.

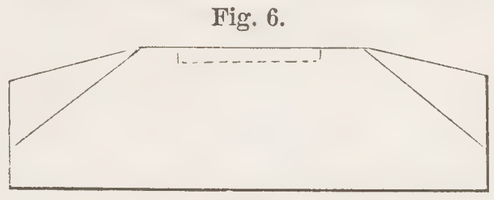


Fig. 4.

Fig. 5.

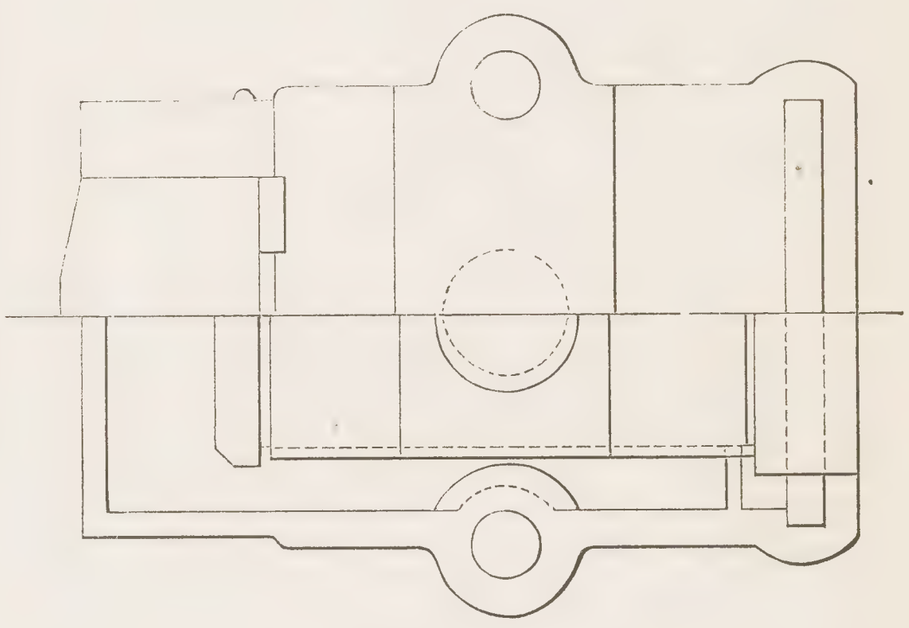


Fig. 3. ¾

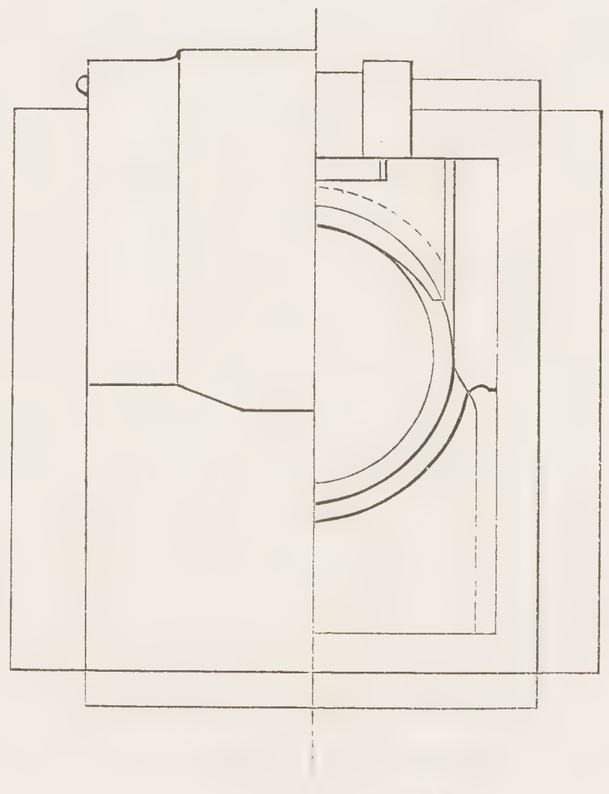


Fig. 2.

A New Railroad Signal.

THE Eastern Railroad (Mass.) is about to place in position, at each station, a signal of such reliability and simplicity as will surpass all others which have heretofore attracted the attention of railroad men. The invention consists of a large wooden box, upon which is firmly set a tin case, inclosing a lamp, the whole being attached to the depot at such a height as to be plainly visible to approaching trains. On opposite sides of the tin box, or the sides designed to face up and down the track, are immovably fixed white glass bull's-eyes of a diameter of five inches, upon which the light from the lamp inside is thrown, and is in turn powerfully reflected upon the track. Inside both the tin and wooden boxes are concealed signals of different colors, which by a simple arrangement of shafts and pulleys, may be so simultaneously raised or lowered as to give at a moment's warning the desired signal. The signals contained in the wooden box are made of tin, are painted red or blue as the case may be, and are lowered through an opening at the bottom of the box. These are designed mainly for use by day. Those contained in the tin box are designed for night use, and consist of colored glasses, so arranged as to be brought between the lamp and bull's-eye. A powerful colored light is by this means thrown up and down the track.

The object of having both connected and so arranged as to be raised and lowered at the same time is, to provide a double safeguard in case of the failure of one or the other to act. To the shafts and pulleys, by which the signals are operated, is connected a strong iron chain, which is introduced through the outside of the depot, and attached to a heavy weight on the inside, thus preserving an equilibrium. The weights are within arm's length of the telegraph operator, who upon receiving a train order may instantly raise or lower the desired signal without leaving his seat. The night-signal is said to be visible three miles.

The arrangement of signals above described is the invention of Mr. A. C. Harvey of St. Johnsbury, Vt., at which place it has been in successful operation for some time. The attention of Mr. H. N. Rowell, the Superintendent of the Eastern Railroad Telegraph Department, being directed to the new invention, Superintendent Prescott was induced to give it a trial. Accordingly, two weeks ago, a signal-box was erected at the Ipswich depot, which has given such satisfaction that orders have been given for its introduction at each station on the Eastern Railroad. During the coming spring, the new signals are to be introduced on the Northern New Hampshire Railroad and the Connecticut and Passumpsic Rivers Railroad. A model was exhibited at the Superintendent's office of the Old Colony Railroad, which gave such satisfaction that a signal-box was immediately ordered for trial.—*Railroad Journal.*

Changes in Trade.

THE last statement of the Bureau of Statistics shows some remarkable changes in our imports from Great Britain as between 1872 and 1873. The change in some leading articles is as follows:

	1872.	1873.
Pig iron, tons	195.157	102,624
Bar, bolt, and rod iron, tons	64,583	23,006
Railway iron, tons	467,304	185,702
Hoops, sheets, and boiler and armor plates, tons	31,407	18,291
Unwrought steel, tons	23,821	19,262
Lead—pig, rolled, sheet, piping, etc., tons	8,353	2,917

In many of these articles this is not unexpected. The partial returns of the year had already shown a steady falling off in our importation of iron and steel, and had given the country reason to believe that it was to be relieved from the obligations it has so long been under to Great Britain. Our domestic iron works, too, have been largely developed, and the cost of making iron has been cheapened here, precisely as it has advanced in England. This may be regarded as a gratifying forecast of the future.

Communications.

The Standard Axle, Crvstallization, etc.

To the Editor of the National Car-Builder:

Dear Sir: There seems to be at present but little public discussion in regard to the various topics which engage the attention of the Master Car-Builders' Association at its annual meetings. This, I am inclined to think, is not caused by any lack of interest in these topics. They are too important to be neglected, especially in view of the next meeting, now near at hand. Much was said by your correspondents in several issues of your valuable journal after the Boston meeting, in regard to the size of journals and other points involved in car construction; and although the views of the writers were more or less conflicting and antagonistic, the effect of such correspondence is beneficial to the general interests of railways, and especially to car-builders. It is an interchange of opinion and individual experience, which is one of the leading objects of the association referred to.

Having been for many years exclusively engaged in the business of car construction, and having adopted and applied, as far as practicable, all the important improvements which have been made within that time, I am nevertheless free to confess that in my judgment entire perfection has not yet been attained. I attended the first regular meeting of master car-builders in this country, and which was held at Adrian, Michigan, in 1866, with the view of organizing an association. I met there men of experience, intelligence, and capacity, who recognized the necessity and usefulness of such an organization, and who now form a part of it. Every subsequent meeting has been attended by increased numbers, all desirous of acquiring additional knowledge and greater skill in their vocation. It has been intimated in some quarters that these meetings, as well as those of the Master Mechanics' Association, were more for the purpose of having a good time, in a convivial sense, than for practical business. As a member of one of these associations, and familiar with the doings of both at their annual meetings, I can inform the authors of such intimations that we *do* have a good time at these meetings—such enjoyment as is inseparable from the personal greetings and association of men engaged in the promotion of a common object. The end and aim of what is said and done is the improvement of every class of railway rolling-stock, and the permanent advancement of railway interests. Whatever rational enjoyment there may be incidental to this, and constituting what may be called a "good time," we claim a legitimate right to in this free country of ours; and we also concede the same right to our caviling friends when they assemble under different circumstances to promote other objects equally worthy, pertaining to their own special vocations.

In regard to the various questions involved in car-building, I propose to touch briefly upon only two of them. First, as to the size of journals, which has excited so much interest among railroad men since the meeting at Boston. With the utmost respect for the opinions of the gentlemen who voted to make the standard size 3¾ x 7, I must say that I think this diameter unnecessarily large, inasmuch as experience has shown that 3¼ journals under 8-wheel cars, will carry 15 tons with entire safety. In 1843, when I commenced car-building in connection with one of our leading lines of road, we used 2½ x 4½ journals, which carried 10 tons, and were never known to break with fair usage. The size and capacity of our car-bodies were subsequently increased, as railway improvements progressed, until journals 3¼ x 7 were used, and it is my opinion that these journals, with proper strength in the other parts of the car, will safely carry 16 tons, and thus save the increased cost and dead weight of a large axle. I agree with a correspondent of yours in the August number of the Car-Builder, that the standard axle is as much out of proportion as would be a man with a child's body—the legs may be good for 36 tons, but the body must be satisfied with ten. Although what is termed the standard axle with its 3¾ journal received a nominal majority at the Boston meeting, such majority would not have been secured for it had not some of the members, on the final trial, voted contrary to their previously expressed views.

The other point upon which I desire to say a few words, is suggested by your correspondent above referred to, who expresses surprise at the apparent ignorance of the Boston convention—with the exception of two delegates representing the Lake Shore road—in regard to "Crystallization"—what it means, how it takes place, how detected, and whether it occurs before or after the axle has been used. I submit that the imputation of ignorance to such a large portion of that assemblage is hardly warranted by the fact that the nature and process of crystallization were not fully elucidated, it being only an incidental point raised in the discussion, and not bearing directly on the main issue, which was the size of the journal. In order to throw some light on the point as to whether crystallization begins before or after the axle has been used, I would say that my own experience proves that it begins after the axle has been used. The iron then becomes harder, the fibre less adhesive, and more like cast-iron. The crystallization begins at the centre, and is not clearly detected until the axle is broken. An axle that has been used for some time is much more easily broken than before it has been used. This appears from a test I once witnessed. Two axles, 4 inches in diameter, one having been in service a year and the other not having been used at all, both made by the same parties and of like material, were each placed under a drop weight falling from an elevation of 50 feet, and striking them with a force equal to 10 tons. The axle that had been in service was broken in three pieces by the first fall of the drop, while the one that had not been used received three successive falls of the drop from the same height, the axle being reversed after each fall. The only effect of the blows was to bend the axle, but in other respects it was apparently as sound after the test as it was before. This little bit of experience, however, does not afford all the light that is needed on this subject, and it is to be hoped that our friends of the Lake Shore Road will aid us in arriving at a more satisfactory solution of the problem.

Inquirer.

Locomotive Mileage.

St. Joseph, Mich., Feb. 9, 1874.

To the Editor of The National Car-Builder:

Dear Sir: I noticed in your last issue a statement showing the comparative mileage of English and American locomotives, in which mention is made of the annual run of engines on several of our leading lines of road, the highest being 29,590 miles for each engine on the Illinois Central. We can show a better performance than that, however, by the passenger engines on the Chicago and Michigan Lake Shore Railroad, the average run of each during the year 1873 being 43,186 miles, and this not including a run of some 25 miles every two weeks to clean boilers. We have engines on this road that run 170 miles every day last year excepting Sundays, and to this should be added 648 miles extra running to be cleaned. These engines were built by the Manchester Locomotive Works, and are numbered and named as follows: 19 Horace Greeley, 22 Adams, 23 William L. Fitch, and 24 Oliver Udell. Number 19 was run by John Couley, a graduate of this road, and number 22 by Cyrus Wood. These engines are still running and are good for one year more before going into the back shop. Our freight-engines average 36,000 miles a year. We have 21 engines on this road, made at the works above named, all doing well. Hon. A. H. Morrison is our superintendent, and C. M. Towler assistant superintendent. Yours truly,

William L. Fitch, M.M.
C. & M. L. S. R.R.

Pittsburg Car-Shop Notes.

A visitor to the city of Pittsburg who looks into the railway car-shops, can not fail of noting the improvements that have been made within the past few years. The same may be said of other important railroad centres. The companies are almost everywhere multiplying facilities for building and repairing rolling-stock, by the erection of large and convenient shops, and the employment of the most effective and economical devices in the way of machinery and tools. These impressions will be confirmed by a visit to the new car and locomotive shops of the

Pittsburg, Fort Wayne, and Chicago Railway,

located at Allegheny City, and which have been finished and nearly all occupied within the past year. The boiler-shop of the locomotive department, and the blacksmith-shop of the car department, only lack their interior fitting up to be ready for business. The change, from the ridiculous to the sublime we might almost say, which has been wrought here in a few years, is very striking, especially with respect to the car-shops, which were formerly small, contracted, and dingy, but now large, airy, well-lighted, and well-ventilated. The main building is 80 x 260, and two stories. On the first floor is the wood-working machinery, including a cylinder dimension-planer 50 feet long, two four-side moulding machines, one shaper, a universal wood-worker, also a boring and mortising machine, all of which are new and have been purchased since the new shops were occupied. The light machinery, cabinet-shop, master car-builder's office, drawing-room, etc., are on the second floor. The coach erection-shop is 75 x 200, and has 13 tracks. It forms an angle with the main building, is one story, and has a trussed roof with two continuous lines of sky-lights which, with the large windows on one side and sash-doors on the other, make the shop nearly as light as out of doors, which in Pittsburg is always a little below the average. Directly opposite the erection-shop, and separated from it by a transfer-table, is the paint-shop.

A good year's work has been done in the car department in spite of the interruption caused by moving from the old to the new buildings. Fourteen new coaches and fifty box-cars have been built. Five baggage-cars, 135 freight cars of all classes, and 10 sleeping and palace-cars have been rebuilt, and 2100 freight-cars of various kinds repaired. Some four-wheeled caboose-cars have also been turned out, with no greater success, however, than has attended the trial of these cars on many other roads in the country. The standard passenger-coaches built here are in point of elegance and all the requisites of ease and comfort as perfect as they well can be. They are 50 feet long, exclusive of platforms, and 10 feet wide, and will seat 60 passengers. The distance from centre to centre of seats is 36 inches. The window-openings are 26 x 40 inches, with two sashes, the lower one raising 22 inches, which is above the level of the passenger's eye and affords an unobstructed view. The panels, mouldings, and other parts of the outside finish are put on so as effectually to shed water. The importance of this is apt to be overlooked by many builders, in proof of which we may mention that in a car-shop of a certain road we recently noticed a first-class palace sleeping-car which had been running only a year, and which needed some repairs to the outside trimming. On removing some of the old work about the windows, it was found that the belt-rails above and below were water-rotted, so as to require new pieces to be put in. This was evidently caused by putting on the lower edge of the letter-panel a bevel moulding, with a projection of probably ¾ of an inch, and corresponding with the one above the panel. This moulding formed a regular water-table, and by working loose, had let in the water with the result stated. These coaches weigh 22 tons and run on six-wheel trucks.

An expert mechanical draughtsman is employed in the shops, whose business it is to make drawings of

all woodwork, from a hand-car to a palace-coach. These drawings are placed on file, so that in case any part of a car requires renewal, or if new work is to be done, it is only necessary to refer to them to know exactly what is wanted. This is as it should be.

Mr. John Marquis is the master car-builder in charge of this department, a position he has held for several years. He is a gentleman of experience and ability in his vocation, as is abundantly attested by the management of the shops and the quantity and quality of the work turned out. The shops are now running ten hours a day.

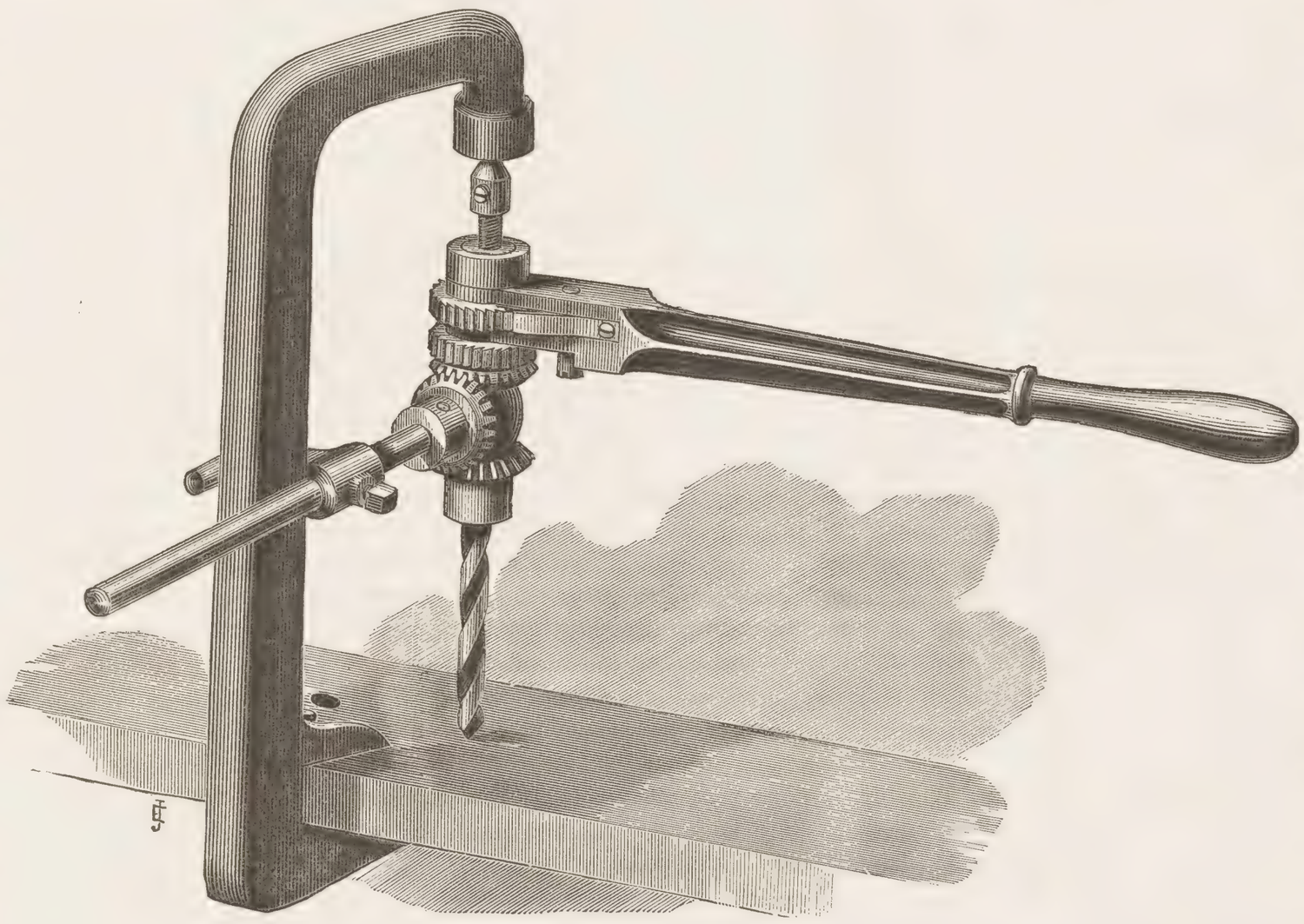
THE WESTINGHOUSE AIR-BRAKE.

This well-known safety appliance for passenger-cars has now been in extensive use for about four years. The apparatus, as originally devised, was a great advance in the right direction; but since then it has been perfected by additional improvements, so that almost every contingency of accident to railway-trains in which brakes can be of service, is amply provided for. The name of the inventor has acquired a world-wide repute for his persevering efforts in utilizing compressed air for this purpose, and supplanting the unreliable and cumbrous hand-brake system. His first application of the principle was made on the Pittsburg, Cincinnati, and St. Louis road, with a train consisting of a locomotive and three cars, since which time the brake has been so improved and perfected, that it is now in use by 150 railway companies representing 30,000 miles of track. In addition to its growing popularity in this country, it has also been introduced in England, Belgium, Mexico, Cuba, and South-America. So indispensable, indeed, has it become as a safety appliance, that no line of road is considered by the traveling public to be fully equipped without it. Its most important features are, that it can be applied by the engineer or conductor; or, in case of breakage of the connections, it applies itself automatically to the whole train.

They are manufactured at the works of the company, in Pittsburg, which are necessarily on an extensive scale in order to meet the demand for complete outfits, renewals, and repairs. The visitor is courteously received at the office, where he is introduced to the superintendent, Mr. Welsh, and by him conducted through the establishment, passing first into the machine-shop. Attention is here attracted to a large frame, upon which are placed a dozen or more air-pumps to be tested before being ready for service. The test is so thorough that any defect is sure to be discovered, so that none but those that are perfect in their working are permitted to leave the establishment. In the centre of this shop is the engine by which the machinery is driven. In its construction it is something of a novelty, and is regarded by Mr. Westinghouse as a pet or favorite. It has four cylinders, each of the same size as the air-pump cylinders; these are placed in pairs facing each other, there being one rotary valve for each pair. This arrangement secures an equal distribution of power to every part of the stroke. A number of machines are made use of to insure perfectly fitting parts belonging to the brake.

On the same floor are the brass and iron foundries. Here, as in other departments, the workmen are classified, so that the same work is done by the same hands, the result being greater completeness in every detail. Over the machine-shop and on the second floor, is the light machinery employed in finishing the various parts. The working of the entire brake is also here exhibited, all the parts and connections, including air-reservoirs, cylinders, pipes, couplings, etc., sufficient to equip a train of ten cars can be set to work, and the automatic action shown by dividing the train in various ways, or in any way likely to occur in practice. The establishment is organized throughout in the most systematic manner, and the extent of the operations carried on is an indication of the growing popularity of the brake.

A FAIRLIE locomotive with twelve 3 ft. 6 in. drivers and 16 by 20 in. cylinders, weighing sixty-two tons, made to burn either wood or coal, has lately been completed in England for the Mexican Railway. It is equipped with the Westinghouse brake, and also with the Le Chatelier counter-pressure steam-brake, which acts only on the locomotive. The engine is to work on a long grade of more than two hundred feet to the mile, and the boiler flues are inclined to suit this grade.



Improved Ratchet-Drill.

THE peculiarity of this drill is shown in the engraving, and consists in an arm and intermediate gearing, by means of which a continuous action is given by the working lever to the bit, thus securing an advantage which enables the operator to do twice as much in a given time as can be done with the ordinary drill. The improvement is the invention of Mr. E. F. Bonaventure, of this city, a mechanical engineer. The drill is made of cast-steel, is very durable, and costs only about twenty-five per cent more than the common ratchet-drill. Orders for them may be addressed to Vose, Dinsmore & Co., 32 Warren street, New-York.

ABRAM REESE, of Pittsburg, the patentee of a self-extinguishing car-stove, proposes to furnish a train of cars of the Pan Handle road with the same, and guarantee that all the stoves in the train shall be so arranged as to be under the control of the engineer, and that he can instantly extinguish all the fires in the stoves at will, without leaving his post.

MR. DANIEL MCLAREN, for ten years past president and previously general superintendent of the Cincinnati, Hamilton, and Dayton Railroad, has resigned his position. He began his service on the road twenty-five years ago as master mechanic, and was superintendent fifteen years.

Railroads in Europe and America.

WE take the following table, with the subjoined comments, from the *Railway Monitor*.

	Railroad, Miles.	Population.	Area, Sq. Miles.
United States	71,565	40,232,000	2,492,316
Germany	12,207	40,111,265	212,091
Austria	5,865	35,943,592	227,234
France	10,333	36,469,875	201,900
Russia in Europe	7,044	71,207,794	1,992,574
Great Britain, 1872	15,814	31,817,108	120,769
Belgium	1,301	4,839,094	11,412
Netherlands	886	3,858,055	13,464
Switzerland	820	2,669,095	15,233
Italy	3,667	26,273,776	107,961
Denmark	420	1,784,741	14,453
Spain	3,401	16,301,850	182,758
Portugal	453	3,987,867	36,510
Sweden and Norway	1,049	5,860,122	188,771
Greece	100	1,332,508	19,941

From this table it appears that in this country we have as much railroad as all the chief nations of Europe, though our population is much less dense than any of those countries. In our sparse population we have a notable impediment, which hinders that division of labor which is one of the main conditions of national growth in wealth. How much density of population and the resulting division of labor helps the growth of nations is admirably shown by Adam Smith in the opening chapter of his great work. Since his day, this principle, which at that time and for ages before was in a crude, undeveloped state, has captured by steam and the telegraph a new energy and empire. An impulse has thus started which covers the seas with ships and fills the continents with labor-saving mechanism equal to thousands of millions of men. Thus has come a revolution in the material growth and productive power of Christendom, of which no man can see the end. This new life, in its turn, has generated social problems that will task the wisdom of future centuries of troubled statesmanship. It is in these new forces, let loose into our modern social system, that we are to explore and interpret the secret of that amazing progress in wealth and national prosperity which has just enabled France to pay the heaviest war indemnity ever exacted from a vanquished nation, which has made England the richest commercial nation of Europe, and has given to the United States those capacities for financial endurance which bore the burdens of the war without the predicted exhaustion, and not only escaped a panic, but at length, when the long-deferred revulsion came, shook it off and recovered with the irrepressible rapidity of last autumn. Much of this recuperative strength, we repeat, is due to our railroads. To the swift transportation and to the telegraphic facilities which railroads have given us, we owe it that our sparse population has not prevented that division of labor which lies at the foundation of the rapid growth in wealth and productive power that marks the age in which we live.

THERE were 108 railroad accidents during the month of January, by which eighteen persons were killed and ninety-eight wounded.

THE Atlantic Car-Works, at Salem, Mass., now employ about 125 men, and are working on a contract for the Eastern Railroad.

The National Car-Builder,
PUBLISHED MONTHLY,
BY
VOSE, DINSMORE & CO.,
32 Warren Street, New-York; 52 Fifth Avenue, Chicago; 720 North Second Street, St. Louis.
JAMES GILLET, EDITOR.
Terms, One Dollar per Annum.

MARCH, 1874.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Answer the Circulars.

IN another part of this paper will be found copies of sundry circulars which have been issued by committees of the Master Mechanics' and Master Car-Builders' Associations for the purpose of obtaining information to be used in making up their reports for the annual meetings to be held in May and June. As the value of these reports will in a great measure, if not entirely, depend upon the material furnished in the way of replies to the questions contained in the circulars, and as but a few weeks remain before the annual meetings will take place, we deem it proper to remind our readers that no time is to be lost in furnishing the information asked for. This matter of answering circulars has heretofore been too much neglected, and the usefulness of the associations has been impaired in a corresponding degree. There has been too much of a disposition to leave every thing to the individual members of committees, as if they could of themselves, without the coöperation of their associates and railroad men generally, get hold of all the facts necessary to be known. What is wanted is exact and reliable information upon every specific point, embodying the experience, observation, and best thinking of practical railroad mechanics in every part of the country. This gives the several committees something tangible to deal with, something to arrange, analyze, and digest, with the view of reaching conclusions that will be definite and valuable.

Many of the answers to circulars are of little value on account of their brevity. There are men connected with the machinery departments of railroads whose experience upon special subjects would be very serviceable, could they be induced to take the time and trouble necessary to impart it. They could, by a little effort, furnish information to these committees which would lead to the settlement of many controverted points in railway operation, without the delay and cost of prolonged experimental testing by each road. We would suggest, in this connection, that the blank spaces in the circulars are not intended to be the measure of what is to be said in reply to questions. Respondents must not imagine they are on the witness stand, where a word too much would technically ruin their case. A few sheets of manuscript devoted to the elaboration of important and special points, are far more acceptable than the mere filling up of the blank spaces, which afford small room for suggestion and the detail of experience.

We hear that the Master Car-Builders' committee on Brakes is making good progress. The report made last year by this committee was an excellent one, and their present labors, in connection with those of the Master Mechanics' committee on the same subject, will doubtless go far toward determining which of the present train-brakes are the best, and what further improvements are necessary to be made. The Master Car-Builders' committee on Car-Roofs is also making commendable progress, having already received some fifteen replies to its circulars, including two that are full and elaborate—that is to say, transcending the allotted space in the circulars. This subject, it will be remembered, was passed over at the June convention for lack of material out of which to make up a report.

Light Freight-Cars.

THE pressing demand for cheaper transportation and greater economy in operating railroads is directing public attention more than ever to the practicability of such a change in the construction of rolling-stock, and particularly of freight-cars, as will diminish the present enormous ratio of dead weight. The subject has already, like car-ventilation, been worn nearly threadbare by prolonged discussion, yet it can not be put aside or laid on the shelf, for the reason that no intelligent railway mechanic or business man believes that all has been done that can be done to lessen the evil complained of. This unbelief is justified by the difference in the construction of cars used on different roads, and also on the same roads, by the many experiments that have been made in the way of building light cars, and by the diversity of opinion which exists among car-builders as to practical means and methods. It is quite clear, indeed, that the model or standard car is yet to be produced that will combine the elements of strength, durability, carrying capacity, and economy of construction, in such a way as to preclude the possibility of further improvement. That such a car will be built some time or other is tolerably certain; but exactly how, or of what materials or combination of materials, is at present a matter we might almost say of conjecture. The tendency of late has been to increase the strength of freight-cars without due attention to their weight, and the result has been heavier vehicles with no material increase in the ratio of carrying capacity. Sundry ambitious attempts have been made from time to time to construct specimen light cars. One after another of these have been put upon the track and worn out, all of them leaving apparently a good record of service; but for want of companionship they seem to have had a lonesome life of it, and after dying a natural death were no more heard of except upon special occasions, in committee rooms, or at annual meetings, when their virtues were recalled and dwelt upon as examples for imitation. Why were not more of these cars made? Was it because they were in advance of the age, or too good for ordinary every-day use, or too much of an innovation upon established custom to meet the approbation of thick-headed managers? Or were they inherently defective?

Without considering the possible advantages to be derived from the use of iron or steel instead of wood, for car-bodies, we think it would be well in the first place to ascertain whether the weight of our ordinary ten-ton box-cars can not be reduced 15 or 20 per cent, without reducing their strength or carrying capacity. Most railway mechanics think it can be done; but if it is made to depend upon isolated experiments here and there by individual car-builders, without a thorough analysis of all the elements and conditions of the problem, based upon such reliable data as can only be obtained by coöperation and organized effort, the progress made will necessarily be slow. The wood and iron of which our present cars are built, are so varied in quality and in their capacity for resisting the different kinds of strain, as to afford a wide range for selection as well as discrimination in their use, so that every inch of such material will be made available, with no superfluous strength or weight. A builder who is mainly bent upon making his cars strong, is apt, in the choice of materials, to regard the weight as of secondary importance, and the result is that what is gained in strength is, in an economical point of view, neutralized by an excess of weight; while, on the other hand, if lightness is the principal thing aimed at, the requisite strength is apt to be overlooked. This is the case both as regards trucks and car-body. The wheels and axles being the foundation upon which every thing else depends, should always, as regards their weight, sustain a certain proportionate and fixed relation to the maximum weight which the journals are capable of sustaining; or, in other words, the capacity of the journals in connection with that of the axles and wheels should be the gauge for determining the weight and carrying capacity of the rest of the car. According to this view, we do not see that the alleged increased weight of the standard axle with its 3¾-inch journals, is any obstacle in the way of lighter freight or passenger-cars, or rather such an adjustment of the proportion between dead and paying weight as will diminish the former and increase the latter so as to make the difference considerably more than it now is.

We are very well aware how much easier it is to write generalities and say what should be done, than to point out specifically how to do it. Not knowing how to do it, but believing nevertheless that it can be done, our object is merely to call attention to the fact that the interests of railways and of the public generally, require that the present surplus weight in rolling-stock should be got rid of, and to suggest that some action be taken by the Master Car-Builders' Association at its next annual meeting, whereby such information may be gathered as will lead to the construction of a freight-car that will put an end to the talk about dead weight. Why not have a standard freight-car of every class as well as a standard axle? The Association has settled the axle question, so far at least as it can be done by voting; ventilation, let us hope, will be disposed of next, and then for a light freight-car. Let a good working committee be appointed that will continue the investigation from year to year if necessary, with the aid and coöperation of every member of the association, and the result can not be otherwise than a good one. The ideal of perfection may not be reached absolutely, but we shall have less dead weight and less diversity in methods and details of construction than we now have.

The Standard Axle.

OUR correspondent, "Inquirer," whose communication will be found on another page, objects to the standard axle recommended by the Master Car-Builders' Association, as being unnecessarily large, and consequently imposing upon roads adopting it an additional burden of dead weight and increased cost. We do not propose to examine these objections, or to deny that they are well founded, so far as they go; but it is evident that there are other points to be considered and weighed before any just conclusions can be reached. These points have often been referred to in our columns. The problem to which they relate, like all others which are subjects of controversy, is a mixed one, and can never be definitely solved until the mechanical advantages and disadvantages are clearly as-

certained and a balance struck between them. In behalf of the so-called standard axle, it has been urged and pretty clearly demonstrated, so far as figures and statistics can be relied upon, that it is stronger and safer; that there is less friction, and consequently less wear both of journals and bearings; less power is required, less fuel, less repairing and renewals, and less general wear and tear. These allegations are either true or false, and any presentation of the other side of the question which ignores or fails to disprove them, will not be likely to convince those who are not already convinced. Although the standard axle is now on trial, and will in due time be able to speak for itself our columns are open in the mean time to the fullest discussion of its merits, with the suggestion to our correspondents that they will try, as far as possible, when they write, to cover the whole ground, by considering all the essential points pro and con.

The weight of the finished axle is 342 pounds. This, it is not to be denied, is a ponderosity somewhat suggestive of dead weight, and not likely to be regarded with equanimity by those who consider 300 pounds as the maximum orthodox limit. If this extra 40 pounds, or thereabouts, could be got rid of without interfering with the journals, it would evidently be a good thing; and it seems to us that some of it, if not all, could be spared from between the wheels. Is there any actual necessity that the axle should have a diameter of 4 inches at its centre? and could it not safely be reduced somewhat on either side of the centre? If so, by all means let it be done, and thus destroy the force of one of the most plausible if not serious objections to its universal adoption.

FOR the information of those who desire back numbers of THE CAR-BUILDER, we would say that of the 30 numbers running from July, 1870, to December, 1872, inclusive, we can supply only about 20, the others having been exhausted. We are prepared, however, to furnish the numbers for 1873, being Vol. IV., in binding complete—price, $2.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the rooms of the Association, 113 Liberty street, on Thursday evening, Feb. 19th. Among the car-builders in attendance were Messrs. I. W. Van Houten, L. Garey, W. E. Chamberlain, C. A. Smith, A. Steinbach, and others; also M. N. Forney, W. G. Creamer, W. C. Baker, W. W. Snow, W. E. Partridge, Professor L. W. Leeds, and Dr. J. G. Allen.

The meeting was called to order by the President of the Association, I. W. Van Houten, who announced that Professor Leeds would, according to previous announcement, deliver an address on the subject of car-warming and ventilation.

Professor Leeds was then introduced and read a paper, remarking that the subject to be dealt with was a very difficult and complicated one, and he feared he could give but little assistance in the way of its solution. The peculiarity of car-ventilation consisted in the variable conditions with which the cars were surrounded; at one moment they were standing still in a closed depot, and soon after moving at a high speed in the face of a freezing wind. In summer, it was often a nice point to determine where the line should be drawn with reference to ridding the car of personal impurities and keeping out cinders and dust; and besides, no three passengers could be found to agree as to the quantity of heat and air required for comfort. It had become fashionable to attribute all our bodily ailments to bad ventilation, and about every third person was trying to remedy it, with respect to cars, by patent ventilating devices or patent stoves, or more properly "lung-scorchers;" others were grumbling and protesting, and others wanted to be let alone.

He believed, however, some radical changes in the present methods of car-ventilation are necessary, and that the best way to determine what they should be, was to understand at the outset what the difficulties are against which we have to contend. The rudimental principles involved were not understood by car-builders, except to a very limited extent, and especially the two great principles of warming, namely, radiation and convection. Warmth imparted by currents of heated air was frequently called indirect radiation, but this was an error. Many who use open fire-places suppose that the fire warms the air in the room, and that the warmth they feel is derived from the air surrounding them, when it is really the effect of radiation; they may feel very hot while the air around them is cold. The air in the room may have a temperature of 50° only, while the thermometer may indicate 70°. Prof. Leeds then explained the "wave" theory as advocated by Prof. Tyndall, showing that the substance or sensation called heat, does not itself travel from the sun to the earth, but that it results from the radiating waves from the sun being stopped by the earth. This was what might be called radiant heat, the nature of which, as distinguished from heat by convection, or conveyance, is essential to be understood in order to apply intelligently any theory or method of warming buildings or cars. The distinction between radiant heat and the warmth derived from currents of heated air coming in contact with our bodies, was then illustrated by an apparatus showing the movement of air between two opposite surfaces, one ice-cold and the other heated, and the effect on thermometers hung on the two sides, some exposed and some protected from radiation. No specific plan for practical car-ventilation was recommended by the Professor, his paper being a scientific elucidation of general principles which should be understood and recognized as a basis, and which clearly indicate that the warming of cars by means of direct radiation from heating surfaces is preferable to any mode of doing it by heated air. No system of ventilation combined with heating was perfect, unless the floors and contiguous surfaces were warm and the air for breathing cool. The colder the air we breathe the more invigorating it is. Radiated heat was the best. Warmed air was bad for breathing; besides, in a car, we could not control it on account of the opening of doors and windows. Agitation was Nature's method of ventilation; a constant change and renewal of air was necessary.

Dr. J. G. Allen controverted some of the minor points made by Prof. Leeds. He thought the statement that the air in cars could not be controlled, was broader than the facts warranted; also the statements that thermometers were unreliable as indicating the temperature of the surrounding air, and that air was purified by mere agitation. Any given volume of impure air might be agitated till doom's-day without being divested of its impurities, but it might be purified by dilution or diffusion, so that the deleterious particles, by coming in contact with other elements, would be destroyed. This, he thought, was accomplished in cars, and ventilation also, by introducing air properly heated at a number of apertures near the bottom, while at the same time the cold air is constantly being drawn off by other apertures near the floor.

A good deal of conversational discussion followed, in which various gentlemen participated; but as no definite conclusions were reached, and much of it being a repetition of what has been said at previous meetings, we shall not attempt to give even an outline of it.

The thanks of the meeting were tendered to Prof. Leeds and Dr. Allen for their addresses.

Mr. George Weissenborn, of New-York, presented to the Association, through the chairman, 23 numbers of "American Locomotive Engineering and Railway Mechanism," a publication illustrated with large and detailed engravings of the latest and most approved locomotive engines, also working-drawings, diagrams, etc., which was received, and the thanks of the meeting tendered to the donor.

The chair announced that the subjects for discussion at the next monthly meeting would be Journal-Bearings, Centre-Plates, and Side-Bearings. The meeting will be held on the 19th of March.

The meeting then adjourned.

Car-Coupling.

BY W. E. PARTRIDGE.

IT has been stated in a recent newspaper article that no less than 400 persons have been killed during the past year on one of our principal railroads, while engaged in coupling cars; and on the basis of this extravagant estimate of the number of casualties on a single road, the writer proceeds to denounce railway companies generally for not adopting safer methods of coupling, and thus protect the lives of their employees. He also suggests that the government, in imitation of a similar course said to have been taken by the German authorities, should offer a reward for a good device for coupling cars. Although we do not credit the above statement in regard to the number of accidents of this kind occurring on one road, there being no evidence to verify it, they are nevertheless sufficiently numerous on all roads to awaken public attention to the necessity of adopting some means to render them less frequent.

It must be evident to intelligent observers that all the accidents which occur in coupling cars are not caused by defective coupling devices. A very large proportion—probably one half of the whole number—are the direct result of carelessness, recklessness, drunkenness, or a lack of ordinary judgment. A higher grade of intelligence on the part of employees, and the payment of better wages, would doubtless diminish very materially the record of accidents, by the exercise of greater care and judgment on the part of this class of train hands. Brakemen often signal the engineer to back at full speed until the cars are within 15 or 20 feet of each other. The shock being too great in such case to allow coupling, the signal is repeated, and a succession of small collisions follow, taxing the patience of the engineer and putting to a severe test the amiability of the brakemen. In many cases, especially in large distributing yards, the number of men and engines employed is insufficient for handling the trains with safety, and they are often made up too rapidly to admit of much care being exercised either in switching or coupling. There is a kind of excitement also in doing things fast which the men are apt to enjoy. Cars are banged about and almost lifted from the rails by the force of concussion, and the breakages resulting therefrom in freight-yards are enormous. The lack of a well-matured system and proper discipline in signaling is the cause of much damage to cars, and peril to life and limb. Many freight-yards are so full of pitfalls and inequalities of surface, that accidents frequently occur from stumbling and falling. Every freight-yard should be leveled up to the top of the ties, and a sufficient number of engines employed to do the switching carefully.

As regards an effective method of automatic coupling, there would seem to be devices enough pressed daily upon the attention of railroad men to remedy existing evils; but the best of these devices are rendered useless to a very considerable extent, so far as self-coupling is concerned, unless there is some approach to uniformity in the height of draw-bars above the rails. The standard height prescribed by the Master Car-Builders' Association is 2 ft. 9 in., and the first necessary preliminary, in order to secure effective and safe coupling, is the adoption of this standard by all roads. There is at present great variation in the height of draw-bars, and without due attention to this fact, many people suppose that the only requisite is a properly contrived coupler. There is really no such want, or at least there ought not to be, in view of the 800 patents, more or less, that have been issued for this species of mechanism, not to mention sundry devices in use which are not patented. There are plenty of them we could mention were it not for making invidious distinctions, and which answer every reason-

able requirement, with a uniform height of draw-bar to facilitate their working. More are not wanted.

Many writers on this subject demand legislative interference in one way or another, the offer of government premiums, etc.; but the general run of lawmakers know little or nothing of the mechanical details of railroad operation, and any attempt on their part to prescribe the use of special devices of any kind, would be more likely to aggravate existing evils than to cure them. All that legislation can safely do in this respect is to hold railroad corporations responsible in damages for personal injuries or loss of life occurring to any one on their roads, whether passengers, employees or others, whenever it shall appear upon investigation that such occurrences are the result of a neglect to use proper safeguards. Railroad men are supposed to be the best judges with respect to the utility of the various mechanical appliances for the prevention of accidents, and they are bound to use the best of these, or be held responsible for a neglect to do so. Self-interest, in view of the consequences of legal penalties, will compel the use of the greatest precaution, without any legislative meddling with specific details.

Steel Rails.

THE Grand Trunk Railway has now 520 of 1377 miles of line laid with steel, concerning the durability of which, Mr. Potter, the President, spoke as follows at the late annual meeting:

"Let me tell you a very curious little incident respecting the life of a steel rail. We have got on our line near Kingston half a mile of steel rails which were laid down in the year 1865. We have got that half mile of steel rails on the most crowded part of our line—laid down in 1865—therefore, over which eight summers and seven winters have passed Now, not one single rail of that sixty or seventy tons has been changed, nor is there any appreciable sign of damage or wear and tear, except that the whole surface is smooth. We had those rails carefully examined and measured by a very delicate instrument. There is no sign of any wear of any kind whatever; none of them have broken—none of them are in any way touched, except that they have a perfectly smooth and even surface; and this instrument shows that, if the wear and tear of the rail continues as it has done for the last seven or eight years, those rails will last for 180 years. I tell you what the instrument shows—of course you must not suppose that I mean to tell you that they will last that time; but that is the simple fact—there is no appreciable wear and tear."

The report of the Chief Engineer of the Philadelphia and Reading Railroad for the year ending with November last says:

"The introduction of steel rails on the main line commenced in September, 1865; and since that time 8374 tons have been laid, of which 13 tons—being experimental rail and not proving satisfactory—were removed from the track. At one of the most trying places in Reading, 41 tons of steel rail were laid in August, 1867, at a point where the life of an iron rail never exceeded four months; and after having done service for six years, they were removed in the fall of 1873, having been worn off uniformly to a thinness not considered suitable to the main track. These rails have been placed in sidings, where they will do duty for some years. There are now 8301 tons of steel rail in our tracks, showing that only 19 tons were removed from causes of either accident, dents, or defective manufacture."

A Lunge at Heavy Palace-Cars.

THE Railroad Commissioners of Maine, in their report for the year 1873, condemn the extravagant style of passenger-cars now in use, and believe that every dollar of outlay in their cost and finish, beyond the points of safety and comfort, is unnecessary, and in tendency mischievous. "It is gratifying," they say, "to perceive a growing condemnation of the ponderous apartment-cars that have been tugged over the roads of Maine, at such a constant loss to the railroad companies, in the wear and tear their passage effects; unnecessary, absurdly heavy, and too often offensively conducted by irresponsible servants, for whose misconduct there is no remedy short of the proprietors, who abide in another State, and for whose sole benefit, pecuniarily, they are maintained. It is believed that the comparatively small portion of the traveling public who in this State occupy these cars, may be equally well provided for in all respects in cars constructed for, and owned and controlled by the railway companies, which might then reap all the benefits that in any way accrue from the use of such cars, and reduce the dead weight thirty or even forty per cent."

In the adoption of a more simple style and make of cars, it is estimated that a train of ten passenger-cars may be reduced in weight thirty tons, and in cost $15,000 below those in present use, with a positive gain both to the stockholders and to passengers. "It is estimated," says the report, "that there are owned by the railroad companies operating wholly or partly in Maine, little less than 500 locomotives, and rather more than 500 passenger cars. The saving in the first cost on this number of each would aggregate $1,000,000. The simple interest on this sum is $60,000. Now, the average cost of operating these roads is 70 per cent of their gross earnings. Hence they have to earn $200,000 annually to net the simple interest on a needless excess of expenditure in engines and cars. But in the general practice, to meet the rate of interest actually paid on this sum of money, the gross earnings annually absorbed would be not less than $300,000. And if the representation of chap. 12 of the 'Great Industries of the United States' is correct, that the average life of a car is but nine years, and that of locomotives is the same, then, in every decade, more than $6,700,000 of these companies' earnings are foolishly perverted."

New-York and Oswego Midland.

THE committee appointed at a meeting of the creditors of this road have reported a plan for a reorganization of the company, and have also arranged for a foreclosure sale. The report says that about $1,500,000 must be provided in cash before any thing can be realized from the property for the first mortgage bondholders. Even when this is done, no proximate date can be safely named as the time when the road, with only its present connections with New-York City, can certainly earn its first mortgage interest. The position is, therefore, such that no plan which provides merely for the funding of coupons will be effectual in protecting the property, and in sufficiently developing it to insure to even the first mortgage bond-holders an edequate income from the property. The road is represented as having cost, including the money received from towns along the line, etc., about $30,000,000, while its equipment is represented as excellent. In addition to this, the report represents that the results attained so far prove that the road has now barely reached the point of meeting its operating expenses, having run behindhand since 18th September last about $90,000. It is safe now to assume that from the opening of the spring business a profitable way business will be steadily developed, and a constant improvement in net earnings may be confidently expected.

MR. GEORGE RHULANDT, master mechanic of the New-Albany and Chicago Railroad, has sent us some specimens of case-hardened iron. These specimens are ⅝ of an inch thick, and are hardened entirely through. The result was obtained in six hours by Mr. Rhulandt's process, which is as follows: Take 1 lb. prussiate of potash and 10 lbs. coarse salt; melt in a crucible and then pulverize. This mixture may be kept on hand for use when wanted. The articles to be case-hardened are placed in a crucible, with enough of the mixture to form a coating over them, and the whole subjected to a red heat for six or eight hours. By this process, the hardening will be found to penetrate deeper than by the old method. It is easily tried, and the result will speak for itself.

Mr. Rhulandt has also a very simple and effective method of cleaning flues, which is worth a trial. It consists of a wooden cylinder, similar to those used for tumbling castings, and made a little longer than the flues to be cleaned. The flues are placed in the cylinder with a suitable quantity of old iron or scrap, and then by a connection with the machinery, the whole is revolved until the flues are cleaned as perfectly as they can be by the expensive machines sold for the purpose.

THE new shops of the Chicago, Danville, and Vincennes Railroad are located at Danville Junction, about one mile north of Danville, Ill. The shops are four in number, and built on a tract of ground about four acres in area. The round-house is a brick building, with stalls for twelve locomotives. The locomotives owned by this line are thirty in number, costing about $12,000 each. The company operates a carpenter-shop in connection with its machine-shop, and at no distant day all its cars will be built there. At present the work is confined to repairing and rebuilding the rolling-stock of the road. The road, though its completion is of comparatively recent date, is doing a large freight and passenger traffic, and is developing the rich coal-fields of that section.

THE Chicago and Alton road will, after March 1st, place an entirely new equipment of Pullman palace and dining-cars on the Chicago, Kansas, and Denver line, and also elegant reclining-seat cars, which will be run through without change. These cars will run over the recently completed bridge at Louisiana, Mo., whose great length, strength, perfect safety, and superb appearance and approaches, with its huge dyke, is one of the engineering marvels of this fast age, and will always form one of the greatest attractions of this deservedly popular route to the West.

THE Eastern (Mass.) Railroad is about to add to some of its first-class engines a feed-water heater, by which a great saving is made in the quantity of coal consumed. The apparatus consists of a coil of pipe placed inside the smoke-stack, and connected with the pipe which supplies the boiler. The cold water from the tender passes through this pipe, and is heated by the exhaust steam and the heat spent from the flues. It has been in operation on the Boston and Maine locomotives for some time, and makes a saving of 1300 pounds of coal daily.

A PLAN for a new entrance into St. Louis of the railroad lines from the West has been agreed upon, and comprises the straightening of the Pacific Railroad track and reducing the grade; establishing a strip of land 200 feet wide for the accommodation of all the roads that will reach the city through Mill Creek valley; carrying all the principal cross streets over the tracks on bridges; connecting the Iron Mountain Railroad with the Western roads by a tunnel; construction of a union depot and depot buildings, and the improvement of the streets in the vicinity of the depot.

THE Midland Railway Company of England found 11,035 umbrellas left along its line, as the consequence of one season's business. And it was not a good year for umbrellas either.

THE Boston and Lowell Railroad has applied the vacuum power-brake to some of its through trains, as well as those on the branch road.

THE Grant Locomotive Works, at Paterson, N. J., have received a large order for engines, and several hundred men have resumed work in the shops.

THE Mansfield Machine Works, at Mansfield, O., are now in the hands of the company again, and work was resumed February 10th.

THOSE prophetic people who affirm that we have attained the utmost possible limit of convenience in travel by rail, will do well to bear in mind that we reached that limit some time ago. An extract from an English paper published in 1839 gives a philosophic and conclusive demonstration that owing to the elasticity and resistance of the air, any effort to run a train above forty miles an hour is of necessity a failure. And in *Gleason's Pictorial,* published in Boston in July, 1853, we find the announcement that Mr. Twitchell, Superintendent of the Boston and Worcester road, has "perfected the comfortable arrangements of the Springfield trains," by introducing, free to the passengers, the luxury of ice-water supplied from a silver urn strapped to a boy who perambulates the train. That was the perfection of comfort in 1853.

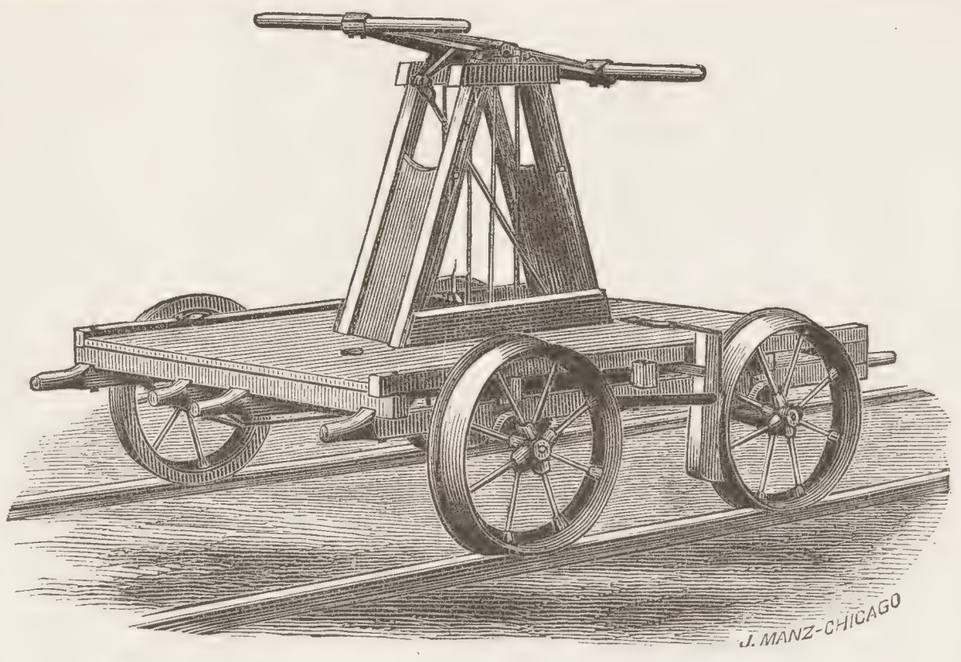
A CORRESPONDENT writing from London says: "We took the underground railway from Euston road station, and in fifteen minutes found ourselves the other side of London, at the Bayswater station. This underground railway is an admirable affair. The speed, regularity, and safety of the trains make up a marvel in the way of transportation. One descends twenty or thirty steps to a dim-lit station, and finds placards as well as officials on every side directing and giving information. One hears a low roar, and in a few seconds the train glides up. It does not touch your platform, so it is not the one you want. In two seconds this train, laden with passengers, is off, and as you watch it your own glides in. Each train has first, second, and third-class cars, and it is striking to see how a crowd sifts itself into place without delay and without confusion."

IT is estimated that the number of railroad ties in present use in the United States is 150,000,000. A cut of 200 ties to the acre is above rather than under the average, and it therefore has required the product of 750,000 acres of well-timbered land to furnish the supply. Railroad ties last about five years, consequently, 30,000,000 ties are used annually for repairs, taking the timber from 150,000 acres. The manufacture of rolling stock disposes of the entire yield of 350,000 acres, and a full supply of 500,000 acres more every year. It appears, then, that our railroads are stripping the country at the rate of one million acres per annum, and their demands are rapidly increasing.

TO purify expended lubricating oil, procure a tub of about 16 gallons capacity, supplied with one spigot at the bottom, and one about four inches above, and placing in it 3½ quarts of boiling water, introduce 2000 grains of chromate of potash, 1540 of soda, 1920 of chloride of calcium, and 3840 of common salt. Then add 50 quarts of the oil to be purified, stir well for five to ten minutes, allow to remain perfectly quiet for a week in a warm place, and draw off the clear oil by the upper spigot.

A NEW snow-plow has been tested on the Flushing and North-Side Railroad. It is built on a platform-car about 30 feet long. In front is placed a frame 12 feet long, elevated at an angle of 45 degrees, the top of which is on a level with the front of the car. The part that first strikes the snow is at the bottom of this frame. It is an iron plate and nose, and receives the snow, which is then caught up by the iron buckets, four feet wide and eight inches high, attached to endless belts of rubber, revolving on cylinders of oak and iron, and thus carrying the snow to the top of the frame and throwing it upon the roof.

MR. GEORGE WESTINGHOUSE, JR., inventor of the atmospheric brake bearing his name, and President of the Westinghouse Air-Brake Company, sailed for Europe on the 25th, to be gone two months, on business connected with the introduction of his brake in that country.



Double-Frame Hand-Car.

THE cut represents one of the many styles of Hand-Cars manufactured by Messrs. Wykoff, Clark & Co., at Howell, Michigan, this being designated on their catalogue as No. 1. It has four longitudinal and five cross-sills of oak or ash lumber, 2¾ x 1½. There are three heavy trusses, the flooring is put on lengthwise, 1½ inch shafting is used; the crank-shaft runs in composition boxes, the other on brasses. The wheels weigh 60 lbs. and have wrought spokes. The material and construction are such as to make it one of the strongest hand-cars of its weight ever built. Vose, Dinsmore & Co. are the agents in New-York for their sale.

A Pullman Car Clearing-House.

A WRITER in the St. Louis *Railway Register* gives the following account of a plan for adjusting the running and repairing expenses of Pullman coaches running on roads doing a joint business.

In January, 1871, the Pennsylvania Railroad and connecting lines entered into an agreement by which the expenses of running and keeping in repair sleeping-cars would be adjusted on a mileage basis. The railroads now participating in the plan are the Pennsylvania, Philadelphia, and Erie; Northern Central; Pittsburg, Fort Wayne, and Chicago; Pittsburg, Cincinnati, and St. Louis; St. Louis, Vandalia, Terre Haute, and Indianapolis; Jefferson, Madison, and Indianapolis; Louisville, Cincinnati, and Lexington; Allegheny Valley; Cincinnati, Hamilton, and Dayton; and Baltimore and Potomac. All Pullman palace sleeping and parlor-cars assigned to these roads, whether on local or through-trains, are considered in the clearing-house. The expenses of these while on the road or in shop are forwarded to the clearing-house by the general superintendent of the roads. A record of each car is kept, the mileage and expenses are here posted monthly under the road headings. At the close of every three months, an apportionment of expenses is made to the several companies, according to the number of miles the car may have run over their road. From this record quarterly statements are prepared, showing the complete workings of all the cars, also the proportion of expenses each road is liable for, and giving them a credit for any bills they may have presented. A summary is then made and balances struck, giving the amount due to or owing by each company. In accordance with these reports, settlements are made between the roads. The quarterly statements, however, are not final. An annual report, covering the entire ground gone over by the quarterlies, is made, which is considered a final closing of the entire work for the year.

This is, in brief, the manner in which the settlement of these joint expenses is effected. It is admitted by the parties interested to be the only way by which an entirely fair adjustment can be arrived at, and the fact that no one of the roads has withdrawn from the arrangement, although by the original agreement any not satisfied were allowed to do so, shows plainly that the plan works satisfactorily.

Facetiæ.

A COUNTRY paper exclaims: "Lives there a man with soul so dead, who never to himself has said, I'll pay, before I go to bed, the debt I owe the printer? Yes, there are some I know full well, who never such a tale could tell, but they I fear will go to —— well, the place where there's no winter."

A BURLINGTON, Iowa, paper says: "A switch engine had a narrow escape yesterday evening, while backing across Fifth street, from being run into by a boy on a sled. So imminent was the danger of a collision that the frightened fireman got off and poulticed the boy with the handle of a copper hammer so as not to mar him, and sent him back up the hill with a sled at his heels, tears in his eyes, and anguish under the tails of his jacket."

A HARTFORD gentleman who had tarried late at a wine supper found his wife awaiting his return in a high state of nervousness. Said she, "Here I've been waiting and rocking in a chair till my head spins round like a top!" "Jess so where I've been," responded he; "it's in the atmosphere."

A WESTERN man who saw a railroad for the first time the other day, wanted to know if "them wus the monopoly people wuz talking about?" He is so pleased with the locomotive, that he is going to have one, if it costs fifty dollars.

THE old lady who used to dry her clothes on the equinoctial line, has gone to the Arctic regions to get the north pole to draw cistern water with.

IT is the opinion of a Western editor that wood goes further when out of doors than when well housed. He says some of his went half a mile.

THE La Crosse man who touched a buzz-saw with his foot to see if the saw was running, is ready to go into court and swear that it was.

A GENTLEMAN of Jackson, Tenn., has preserved in alcohol a bed-bug which was caught in a bed that General Jackson slept in!

THE Philadelphia doctors are so absorbed in the dissection of the Siamese twins that they neglect other business, and patients are getting well all around them.

A NEVADA judge, after the jury had been impaneled and counsel ready to proceed, pulled out a revolver and judicially remarked, "If any man goes frolicking around in this court-room during the trial of this cause, I shall interrupt him in his career." The strictest decorum prevailed.

"DO you go to Sabbath-school, my lad?" kindly asked a city missionary of a depraved little Dubuque urchin. "Nary," answered the innocent child, "but I've got a fighting cock that can walk over any bird in this town that wears gaffs."

"PADDY," says a joker, "why don't you have your ears cropped? they are entirely too long for a man." "And yours," replied Pat, "ought to be lengthened; they are too short for an ass."

THE entrance to the new San Francisco hotel is said to be so very wide that the man must be mighty drunk, indeed, who can't start from the opposite side of the street and hit it at least seven times out of ten.

AN Irishman decapitated a turtle, and afterward was amusing himself by putting sticks into its mouth, which it bit with violence. A lady who saw the proceeding, exclaimed, "Why, Pat, I thought the turtle was dead?" "So it is, ma'am; but the crather's insensible of it."

A TAILOR sent in his bill for clothing to the editor of a literary magazine, who returned it with a note saying that the manuscript was respectfully declined.

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AURORA, ILL., March 5, 1873.

GENTS: We have used your Metallic Paint about 12 years, more especially on locomotive work, and before adopting it, put it to the most severe tests of extreme heat and strong brine, at the same time testing comparatively, lead (white and red) and other Metallic Paints, and in these tests the "Prince's" came out ahead. I am satisfied that for engine and other iron work it is superior to any paint in use. Our paint-shop was painted two coats with it and boiled oil in February, 1863, and the paint is in good condition at this date, not having been painted since 1863. Respectfully, D. C. COOLEY.

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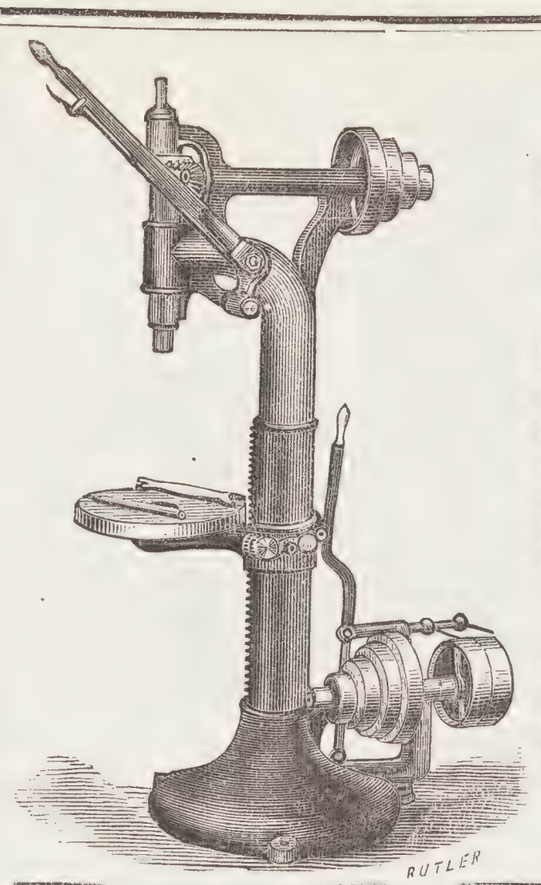

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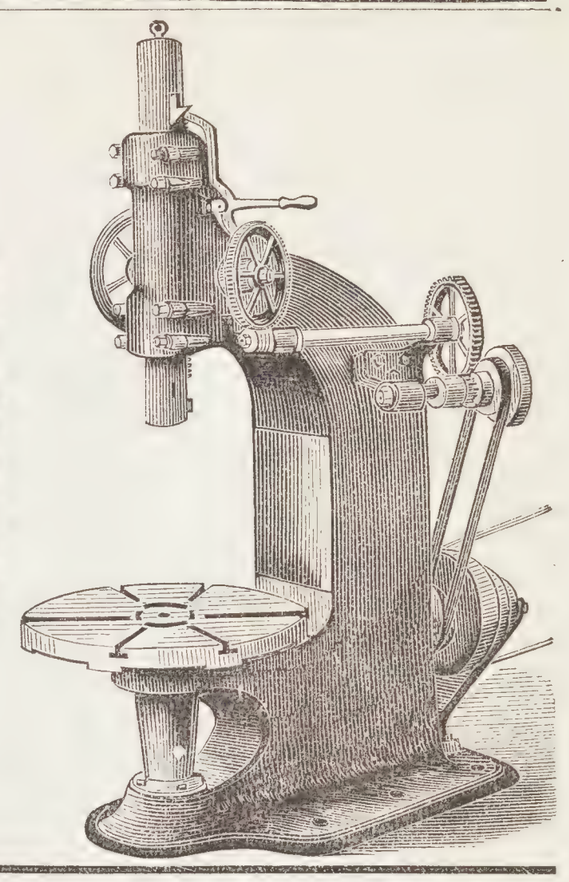

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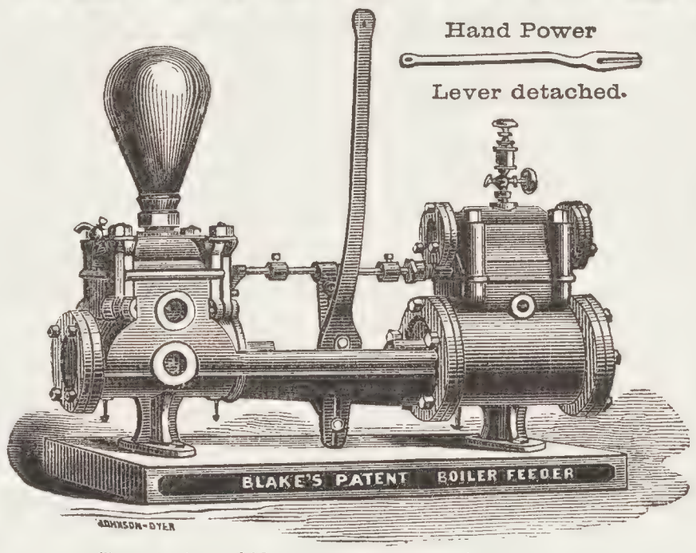

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DEVLAN'S PATENT ELASTIC WASTE,

It being composed of Incombustible and Lubricating Materials, "Hot Journals" are impossible where the Waste is properly used.

Certificates from Railroad Officials, showing its very decided advantages, are herewith annexed—namely:

PENNSYLVANIA RAILROAD—NEW-YORK DIVISION, JERSEY CITY, July 11, 1873.

GEO. W. BARKER, ESQ., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872. I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, ESQ., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your request herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, ESQ., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

OFFICE, ELASTIC WASTE COMPANY, No. 60 BROADWAY, NEW-YORK.

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Atlantic Car-Works	Salem, Mass.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canada Steam-Engine Co	Kingston, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
Corunna Car Co	Corunna, Mich.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Detroit Car and Manufacturing Co	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Fremont Car Co	Fremont, Ohio.
Gardner, F. & Co	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del.
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Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Indianapolis Car Co	Indianapolis, Ind.
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Jackson & Woodin Manufacturing Co	Berwick, Pa.
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Kimball Manufacturing Co	San Francisco, Cal.
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Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield, Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
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Northumberland Car & Mfg. Co	Northumberland, Pa.
Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Piqua Car and Agricultural Works	Piqua, Ohio.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
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South-Western Car Co	Jeffersonville, Ind.
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Vigo Foundry and Terre Haute Car-Works	Terre Haute, Ind.
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Wason Manufacturing Co	Springfield, Mass
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Barney & Smith Manufacturing Co	Dayton, Ohio.
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Dawson Manufacturing Co	Dawson, Ga.
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Green's Car-Wheel Manufacturing Co	St. Louis, Mo.
Hamtramck Car-Wheel Works	Detroit, Mich.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
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Jackson & Woodin	Berwick, Pa.
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Lobdell Car-Wheel Works	Wilmington, Del.
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Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
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Missouri Car and Foundry Co	St. Louis, Mo.
Moore Elastic Car-Wheel Co	Jersey City, N. J.
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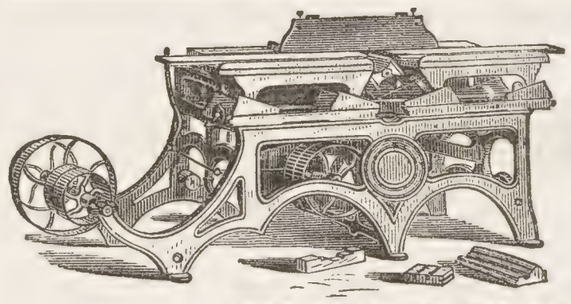

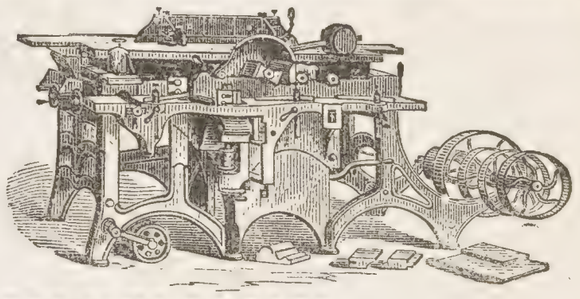

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Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn
East Tennessee & Georgia	Eli Hixon		Knoxville, Tenn
East Pennsylvania		Samuel Reeves	Reading, Pa
Elizabethtown and Paducah	W D. Robb	T. A. Cordrey	Elizabethtown, Ky.
Erie Railway	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna, Pa.
Erie Railway	‖V. Blackburn		Jersey City, N. J.
Erie Railway	‖J. G. Hubbard	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E Cooper	W. E. Cooper	Hornellsville, N. Y
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Jno. G. Coulon		Galveston, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me
Grand Trunk	†Richard Eaton	J. W. W. McWood.	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Sol. Bills	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman.	T. M. Preval.	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland, Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H L Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McKee	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	J. Salisbury	M. Tellerhoof	Saxton, Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J B Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. T. Sanford	R. B. More	Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div.	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div.	**L. H. Waugh.		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff.	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas.	Chester, S. C.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey	E. R. Brown, Mauch Chunk, Pa.	South Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	A. Mitchell		Delano, Pa.
Lehigh Valley	D. Clark		H zleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson.	Ellis Dodge	Hunter's Point, IL.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland. Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart. Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk. Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo. N. Y.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River. Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.
M			
Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John E lis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Macon & Western	D. M. Gogul	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N H.
Marietta & Pittsburg	W. J. Adams		Marietta. Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	M. Thornton	M Thornton	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe. Ohio.
Memphis & Little Rock	Tho. Rennells	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis. Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point. Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn
Mississippi Central	Henry Gibbon	John E. Becton	Water Valley. Miss
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific			Nebraska City, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere. Wis.
Milwaukee & St. Paul	T. S. Davis	Wm. E. Kittredge	Milwaukee, Wis.
Milwaukee & St. Paul		John Baillie	Milwaukee. Wis.
Milwaukee & St. Paul	J. Pattee	D. F. Wilson	Minneapolis. Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Grand River Valley Division		James Potts	Jackson, Mich.
J'kson, Lans'g & Saginaw Div.			Jackson Mich.
Mississipi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard. Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
	B. S. Skates	Jacob Huy	Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte. Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville. Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	Fredericton, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem.	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	††Joseph Jones	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls. N. Y.
Hudson River Division	‡Wm. Buchanan	John McKenna.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc.,N.Y.
New-York & Oswego Midland	‖Wm. H. Griggs	Wm. H Griggs	Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich. N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston. Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas H. Anderson	Providence. R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven. Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford. Ct.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah. Ky.
New-Orleans, Jackson & Gt. Northern	N. Greener	N. Greener	New-Orleans. La.
Naugatuck	Henry Hanford	George. W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon. Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North Eastern	D. W. Haines	A. M. Corrie	Florence, S C.
Northern	James W. Lander	Albert Langmaid	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
O			
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston.Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H.J.Bookhammer	Jacob Williams	Oil City, Pa.
Oil Creek & Alleghany	H.J.Bookhammer	John Monks	Oil City, Pa.
Ohio & Mississippi		G.Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott	Chas. Hyatt	East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	J. D. Linning		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	John Hewitt	St Louis, Mo.
Pennsylvania	§§Frank Thomson		Altoona, Pa
Pennsylvania	H D. Garrett	I. W. Van Houten	W. Philadelphia,Pa.
Pennsylvania	E. L Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg. Pa.
New-Jersey Division	John Headden	David H. Baker	Jersey City. N. J.
West-Penn. Division	C. B. Street	James F. Elder	Blairsville, Pa.
Philadelphia. Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence*
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L B. Paxson	Aaron Steinbach	Readin g, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis			
Pittsburg & Columbus Division	E. Pierce		Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Pendleton. Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria. Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg. Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg. Fort Wayne & Chicago	J. M. Boon	Israel Lee	Fort Wayne, Ind.
Pittsburg. Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	A. S. Kinsey		Pittsburg, Pa.
Peoria, Pekin & Jacksonville	R F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland. Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland. Me.
Port Royal.	C. W. Furber	E. Hubard	Port Royal, S. C.
Port Hope. Lindsay & Beaverton	H G Taylor	H. G Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village N H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester	Joseph Kelly	Olney L Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie,N. Y
Q			
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.
R			
Raleigh & Gaston.	J. B. Gayle	J. B. Gayle	Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	H, Longest	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond. Va.
Rive De Loup	P. A Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome. N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia.	O. W. Harbin	O. W. Harbin	Rome. Ga.
Rochester & Genesee Valley.	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott. Canada.
St. Louis & Iron Mountain	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island		M. Heitzman	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis Vandalia. T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M.Gogul	James A. Knight	Macon. Ga.
South Shore	Warren E Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo. C. E.
Seaboard & Roanoke	§E. G. Ghio	J. B. Pendleton	Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton	A. G. Maynes	W W. Peirce	Selma. Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val.,Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Sheboygan & Fond du Lac	A. F. Wallace.	A. F. Wallace	Sheboygan. Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N. Y.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.
T			
Taunton Branch.	W. M. Parks	J. G. Codding	Taunton, Mass.
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	W. H. Hipple		Marshall, Texas.
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn
Toledo, Wabash & Western	**G. W. Cushing	‖J. B. Morse	Fort Wayne, Ind.
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	‖James King		Springfield, Ill.
Toledo, Wabash & Western		‖‖U. H. Kohler	Toledo. Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto. Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.
U			
Union Pacific	§I. H. Congdon	Geo. E. Stevens	Omaha, Nebrask
Utah Central	Thos. Pierpont	Edward Cox	Salt Lake City.
Utica & Black River	Wm. E. Granger	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vicksburg & Brunswick	James Boon	J. A. Knight	Eufaula, Ala.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland. Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.
W			
Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	George Hall	W. J. Calais	Wilmington, N.C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia.Pa.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	Jas. F. Van Horn		Coatesville, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M W Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria. Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
A			
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Albany, N. Y.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.
B			
Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	J. B. Winslow		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.
C			
Cairo & Fulton	J. H. Morley	W. H. Hallett	Little Rock, Ark.
Cairo & St. Louis	C Hamilton		St. Louis, Mo.
Cairo & Vincennes	L. W Palmer		Cairo, Ill.
Camden & Atlantic	E. Collings		Camden, N. J.
Canada Southern	*J S. Casement		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	D. Williams		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Sacramento & Oregon Division	J. A. Fillmore		Sacramento, Cal.
Western & Visalia Division	E. C. Fellows		Oakland, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humbolt Division	R. S. Mattison		Carlin, Nevada.
Salt-Lake Division	R. H. Pratt		Ogden, Utah.
California & Pacific Division	A D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart		Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. T. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. W. Bowen		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Pekin & Southwestern	N. J. T. Dana		Streator, Ill.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati, Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron		Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough		Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Akron, Ohio.
Colorado Central	T. E. Sickles		Golden, Col.
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Wm. M. Parker		Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
D			
Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	Milton Weston		New-York City.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware, Lackawanna & Western	W. F. Halstead	G. W. B. Cushing	Scranton, Pa.
Morris & Essex Division	Andrew Reasmer	G. W. Bleashing	Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Des Moines Valley	John Givin	G. E. Kilbourne	Keokuk, Iowa.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese		Detroit, Mich.
Dorchester & Delaware	J. M Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.
E			
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)	J. Prescott	C. W. Pratt	Boston, Mass.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Elizabethtown & Paducah	D. Brock	D. Brock	Elizabethtown, Ky.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.
F			
Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw, Mich.
Florida Central	F. P. Papy		Jacksonville, Fla.
Flushing & North-Side	I. D. Barton		Hunter's Point, L.I.
Fort Wayne, Jackson & Saginaw	W. A. Erust	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.
G			
Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson		Augusta, Ga.
Gilman, Clinton & Springfield	S. H. Melvin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Mathcany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich
Grand Rapids & Indiana		William Mullins	Pittsburg, Pa.
Grand Trunk	C. J. Brydges	John Taylor	Montreal, Canada.
East Division	Henry Bailey		
West Division	W. J. Spicer		
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.
H			
Hannibal & St. Joseph	L. W. Towne	A. W. Lamb	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top	J. McKillips	B. A. Knight	Huntingdon, Pa.
I			
Illinois Central	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	George L. Barringer		Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell		Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.
J			
Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	S. Conant		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Junction & Breakwater	John A. Sheaff		Lewis, Del.
K			
Kansas Central	A. E. Buchanan		Leavenworth, Kan
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		Detroit, Mich.
Kansas Pacific	Edward S. Bowen		Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H Briggs		Keokuk, Iowa.
Knox & Lincoln	C. A. Combs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound	G.W. B.Cushing	Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. H. Grant	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	Chas. B. Peck	E. O. Foote, Jr.	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
	L. Chamberlin		Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahoy Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	E. C. Dawes		Terae Haute, Ind.
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L. I.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Rcbert Meek		Clarksville, Tenn.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	M. Stanton		Birmingham, Ala.
Louisville, Cin. & Lexington	George Skinner	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	M. Sloat	J. R. Parker	New-Albany, Ind.
M			
Macon & Brunswick	William McRae	Solomon Hass	Macon, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta & Pittsburg	A. J. Warner	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	C. E. Van Cleve	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	George A. Burt		Carthage, Mo.
Memphis & Little Rock	A. S. Livermore		Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis. Tenn.
Michigan Central	H. E. Sargent		Detroit, Mich.
Michigan Central		John Newell	Detroit, Mich.
Grand River Valley Division	Chas. Desmond		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	Geo. C. Hopper		Saginaw City, Mich.
South-Haven Division	Geo. E. Curtiss		Kalamazoo, Mich.
Jolict Division	Carlton Wheeler		Joliet, Mich.
South-Bend Division			
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse		Lincoln, Neb.
Milwaukee, Lake Shore & Western	W. Elwell		Sheboygan, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Milwaukee & St. Paul	*S. S. Merrill	Rob't Wason	Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mississippi Central	R. N. Colquhoun		Water Valley, Miss.
Mississippi Central	*E. D Frost	A. S. Roberts	New-Orleans, La.
Mississippi & Tennessee	M. Burke	M. Burk	Memphis, Tenn.
Mississippi Valley & Western	E. P. Buell		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	F. W. Bowen	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Hamilton		Chetopa, Kansas.
Choctaw Division	S. G. Eddy		Holden, Mo.
Eastern Division	Mark M. Towne		Hannibal, Mo.
Sedalia Division	Mark M. Towne		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allen Bowen	Kansas City, Mo.
Mobile & Ohio	L. J. Fleming	C. E. Rushing	Mobile, Ala.
	Cecil Fleming		Mobile, Ala.
	E. S. Hosford		Macon, Miss.
	M. M. Miller		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas		Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart	Thomas Williams	St. Stephen, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey Midland	W. E Lewis		Wortendyke, N. J.
New-Jersey Southern	M. W. Serat		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, Jackson & Great Northern	*E. D. Frost	S. H. Edgar	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. M. Wilcox		New-Haven, Ct.
New-York, Boston & Montreal	C L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast	C. V. DeForest	Albany, N. Y.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M Andrews		Worcester, Mass.
New-York & Oswego Midland	C. W. Douglas	P. Bundy	New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
Northern Pacific	*C. W. Mead		St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	J. S. Redfield		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	J. J. Lawrence		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.
P			
Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	W. H. Brown		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Blairsville, Pa.
Pensacola & Louisville	Daniel H. Cram		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin	E. Lewis	Erie, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Blair		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	*J. N. McCullough.	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	Hugh Pitcairn		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough.	Wm. Mullins	Pittsburg, Pa.
Eastern Division	Richard Wiggin		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	S. C. Millett		Port Royal, S. C.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
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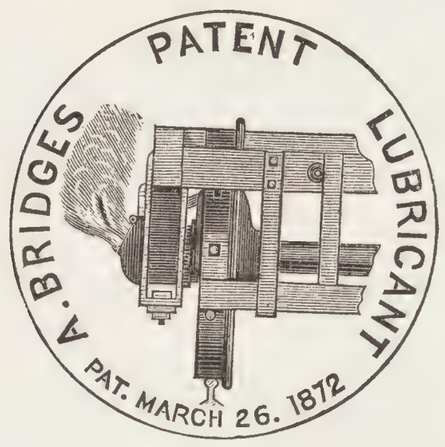

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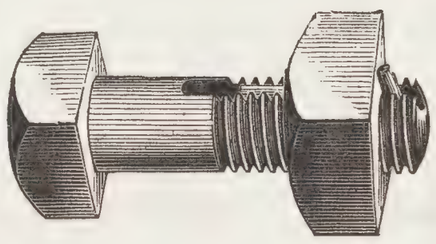
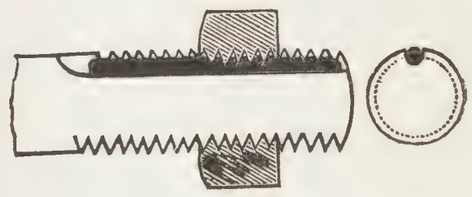


"CUMMING NUT-LOCK,"
Patented
June 16, 1868,
August 23, 1870.



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This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

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Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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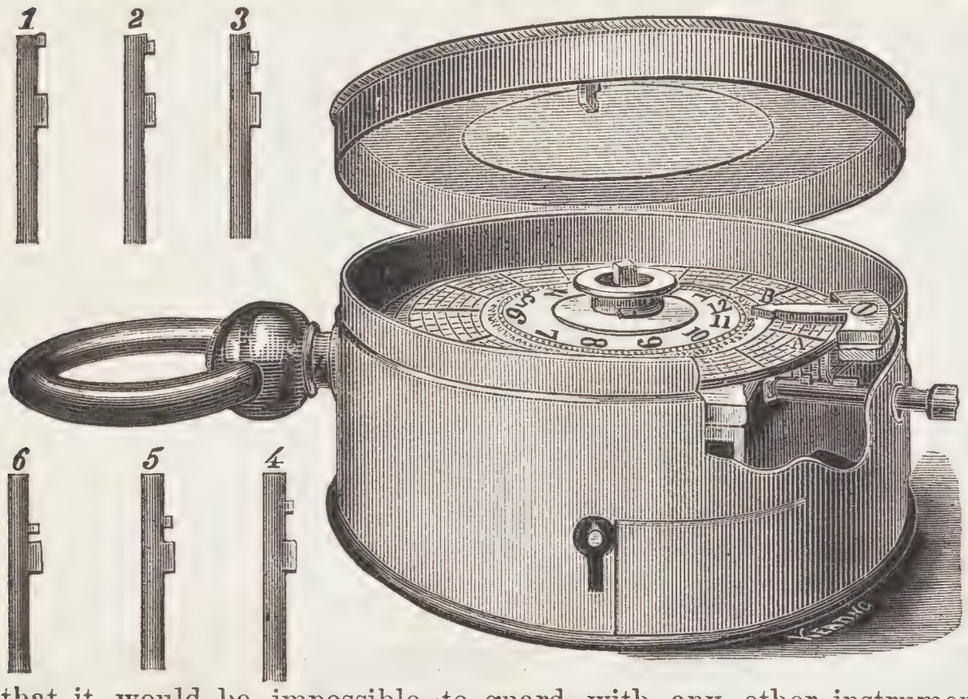

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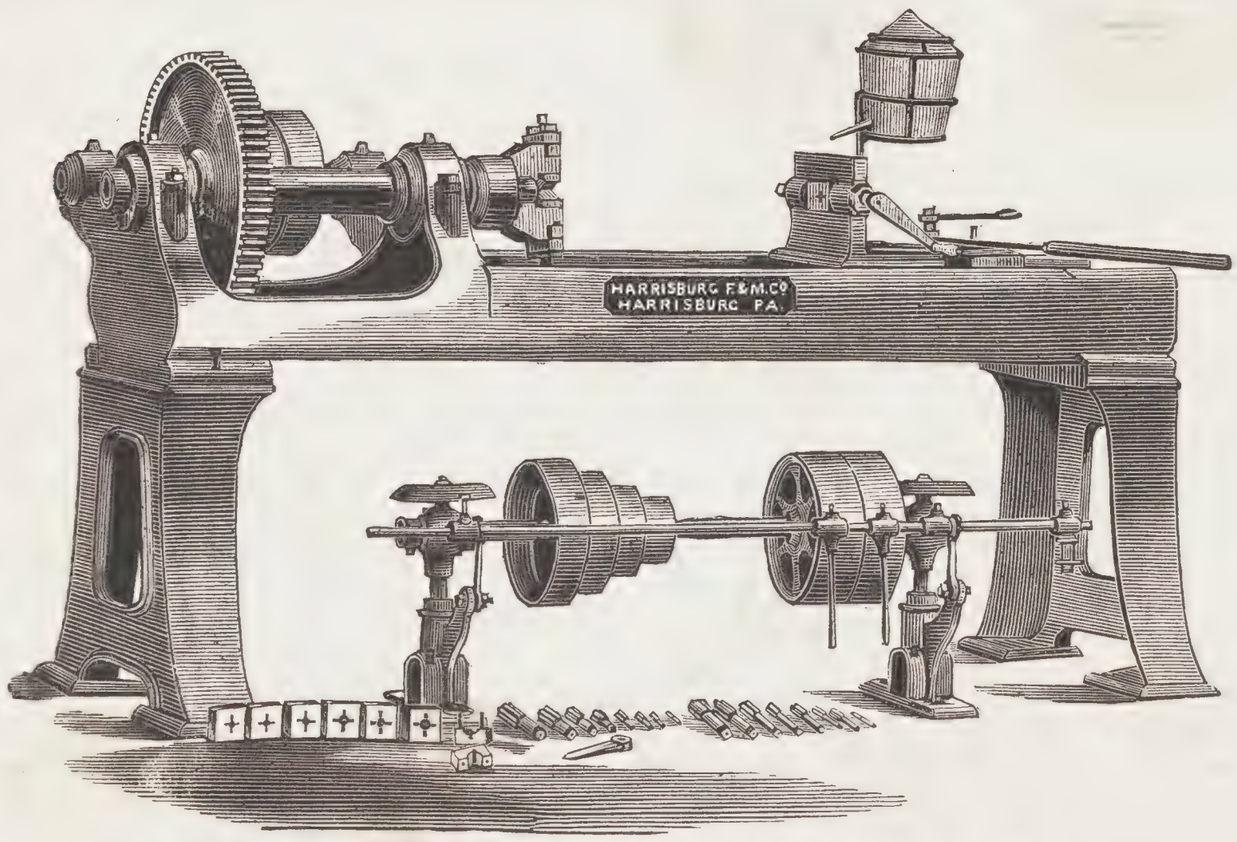

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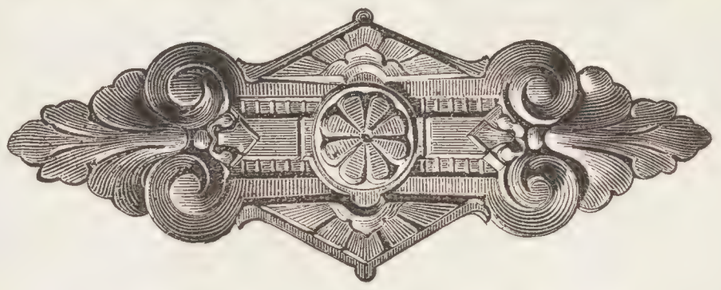

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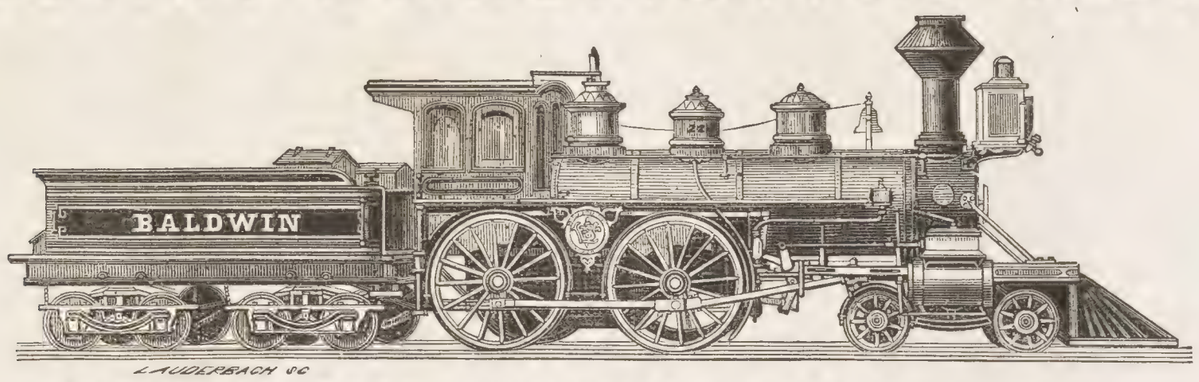

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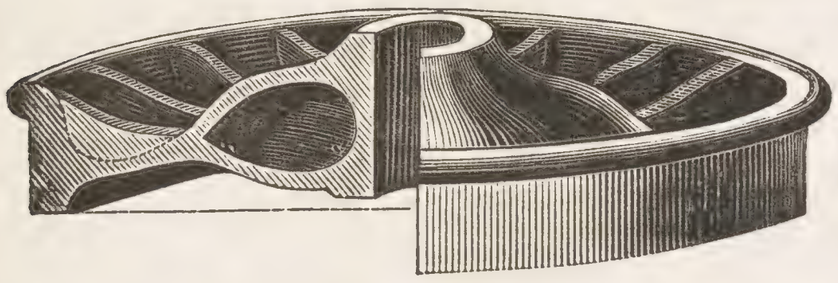

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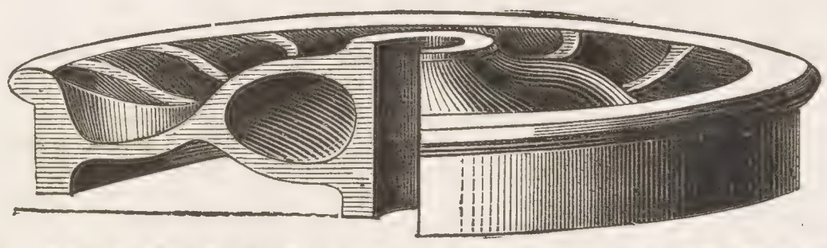

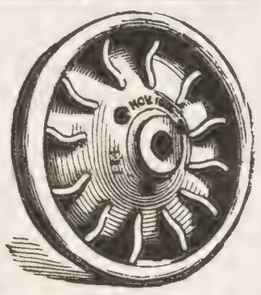

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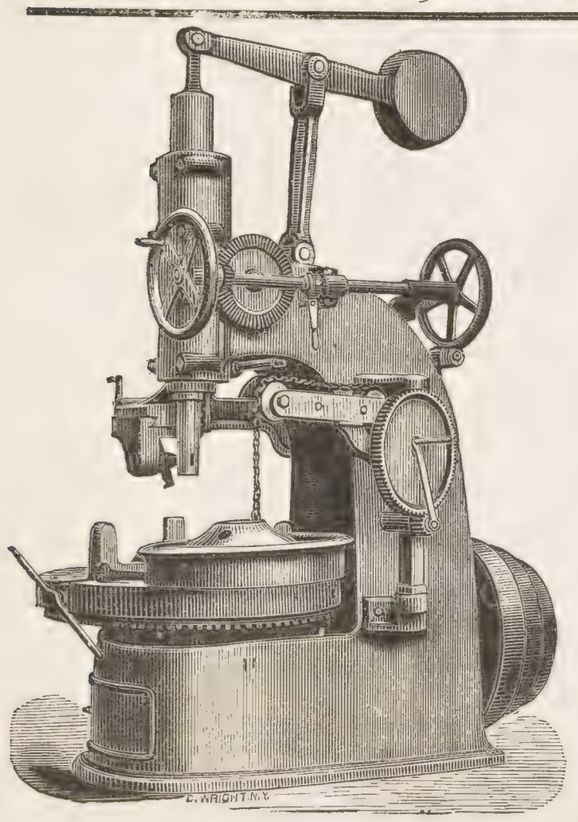

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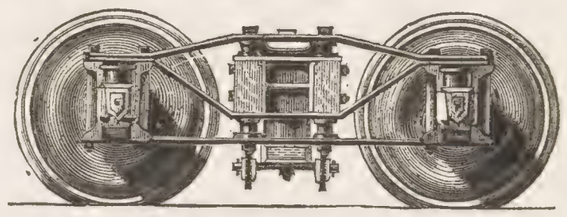

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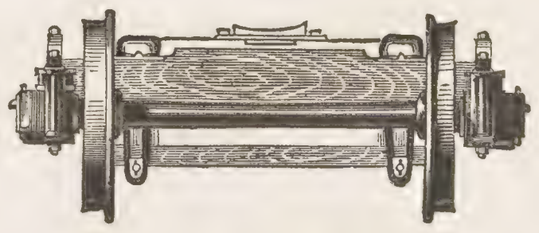

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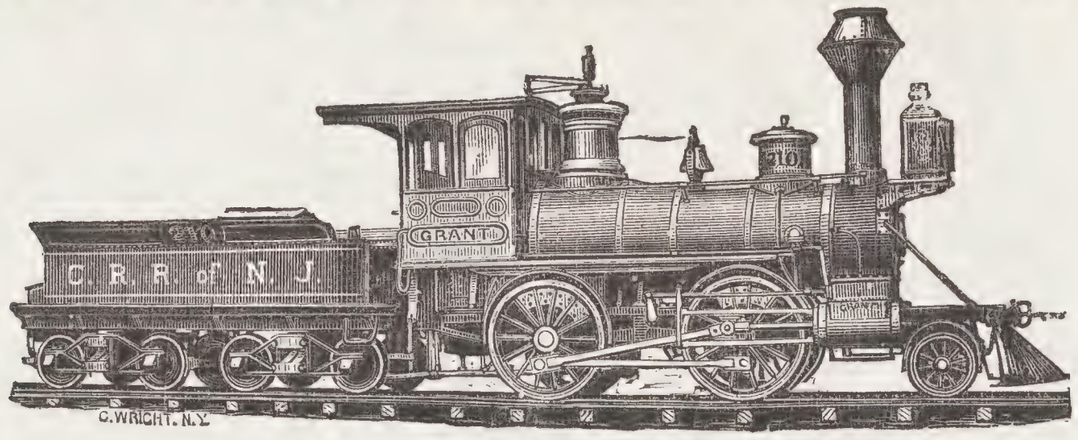

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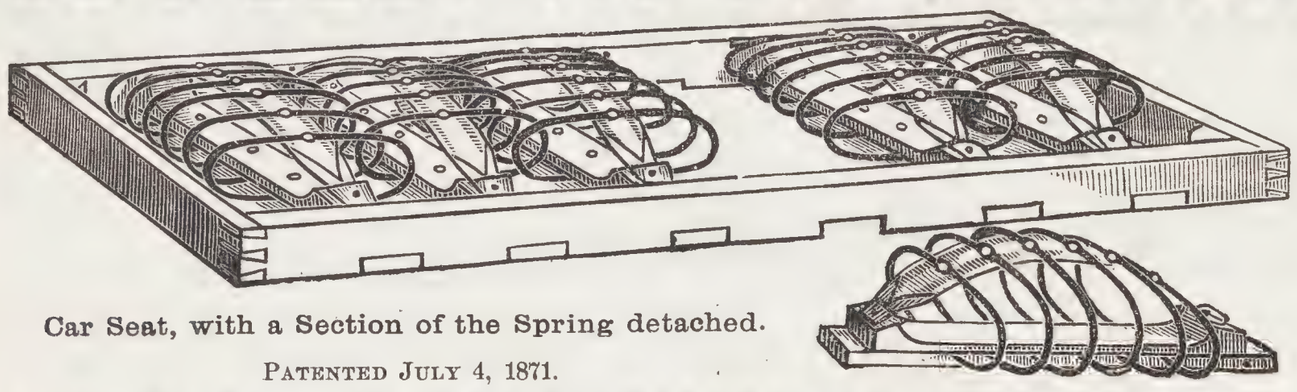

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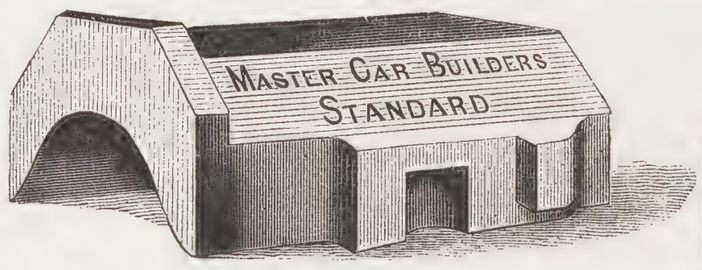

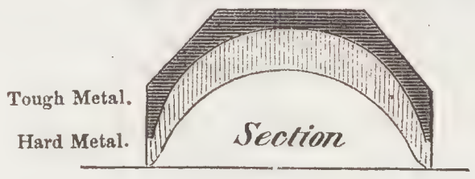

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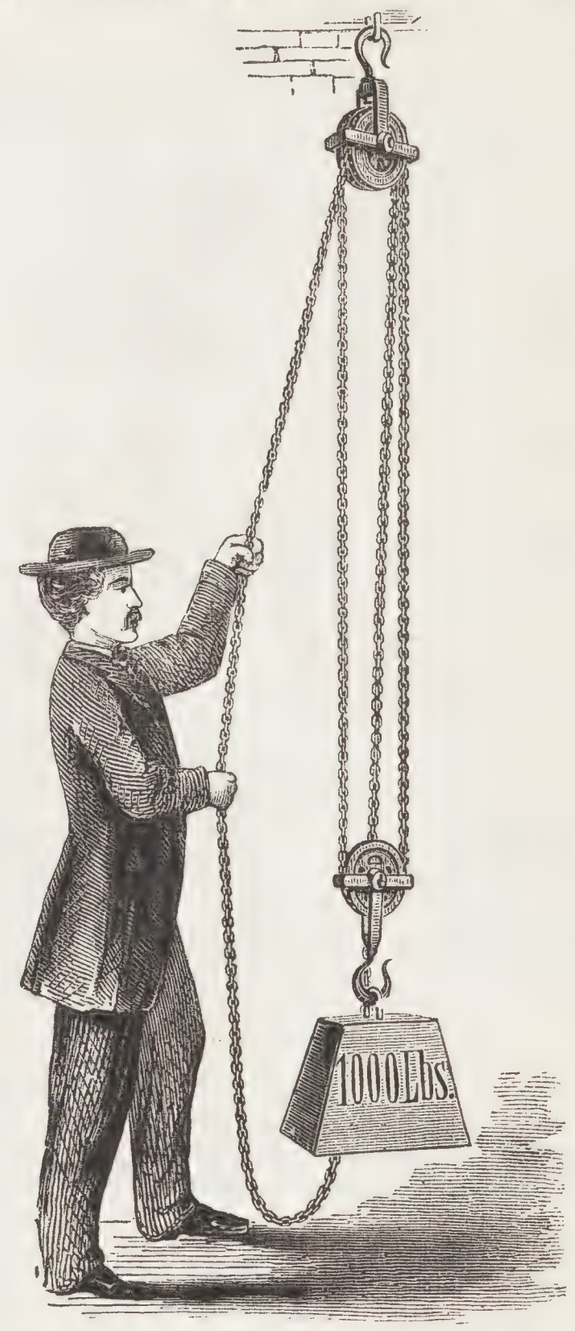

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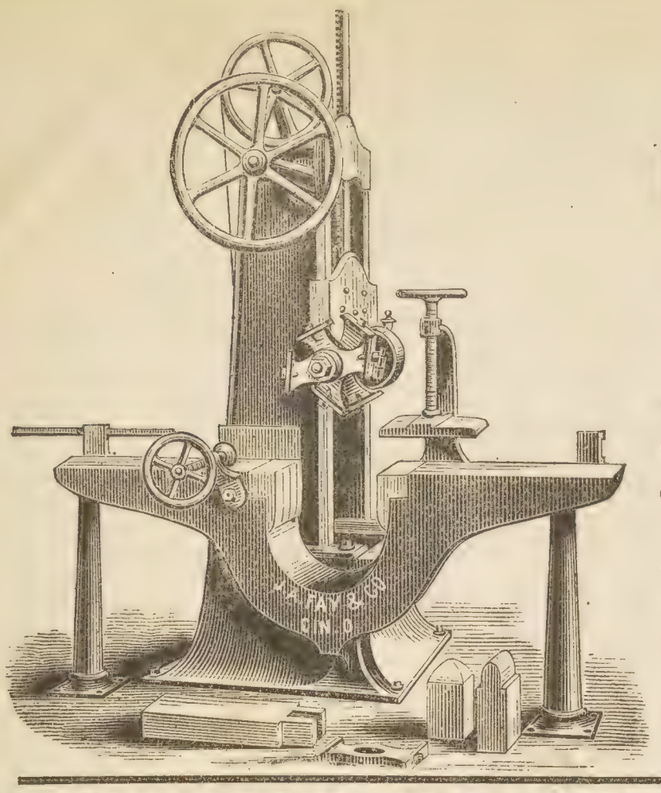

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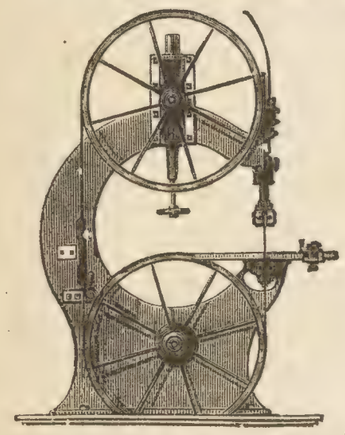

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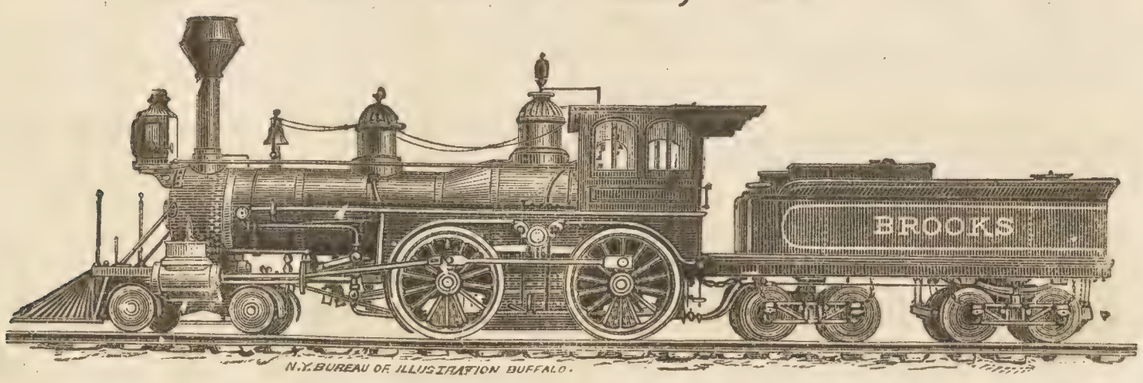

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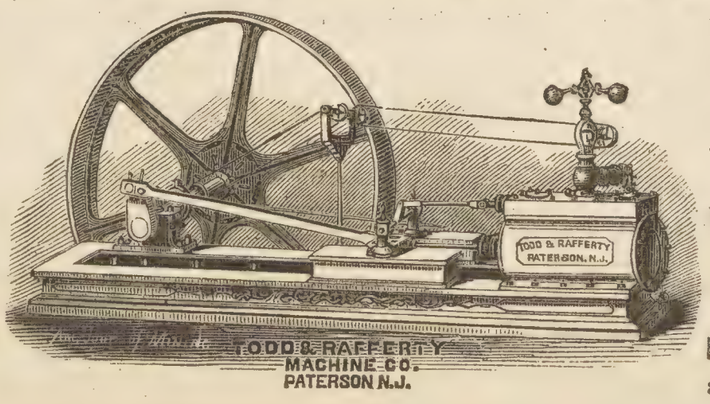

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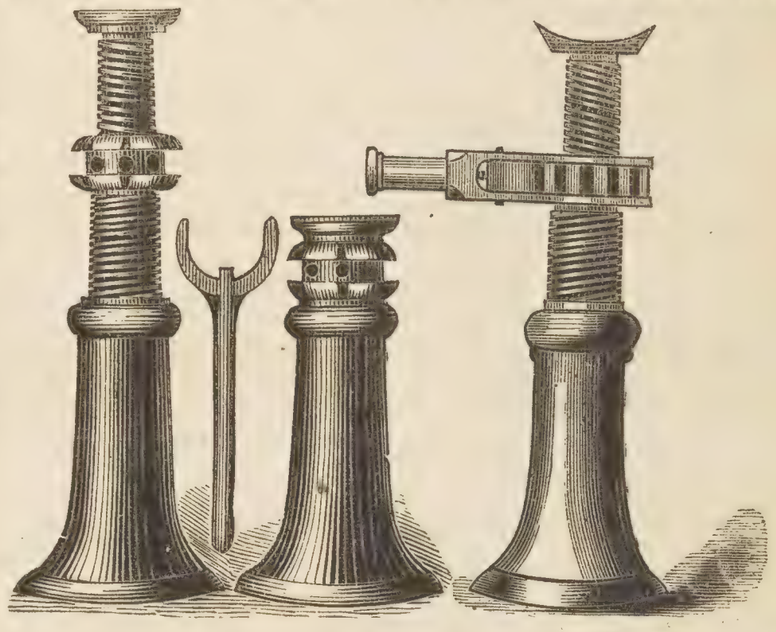

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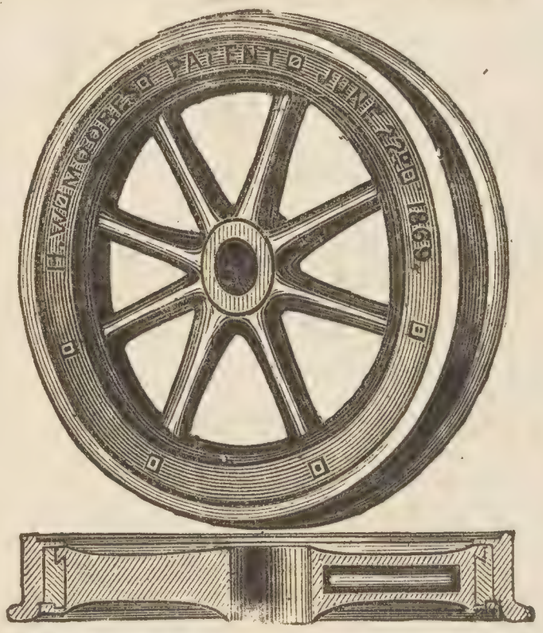

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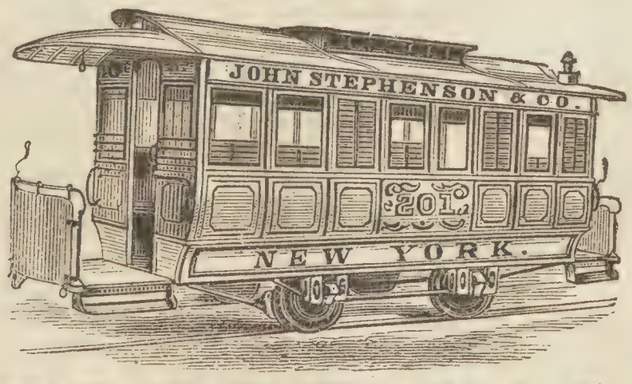

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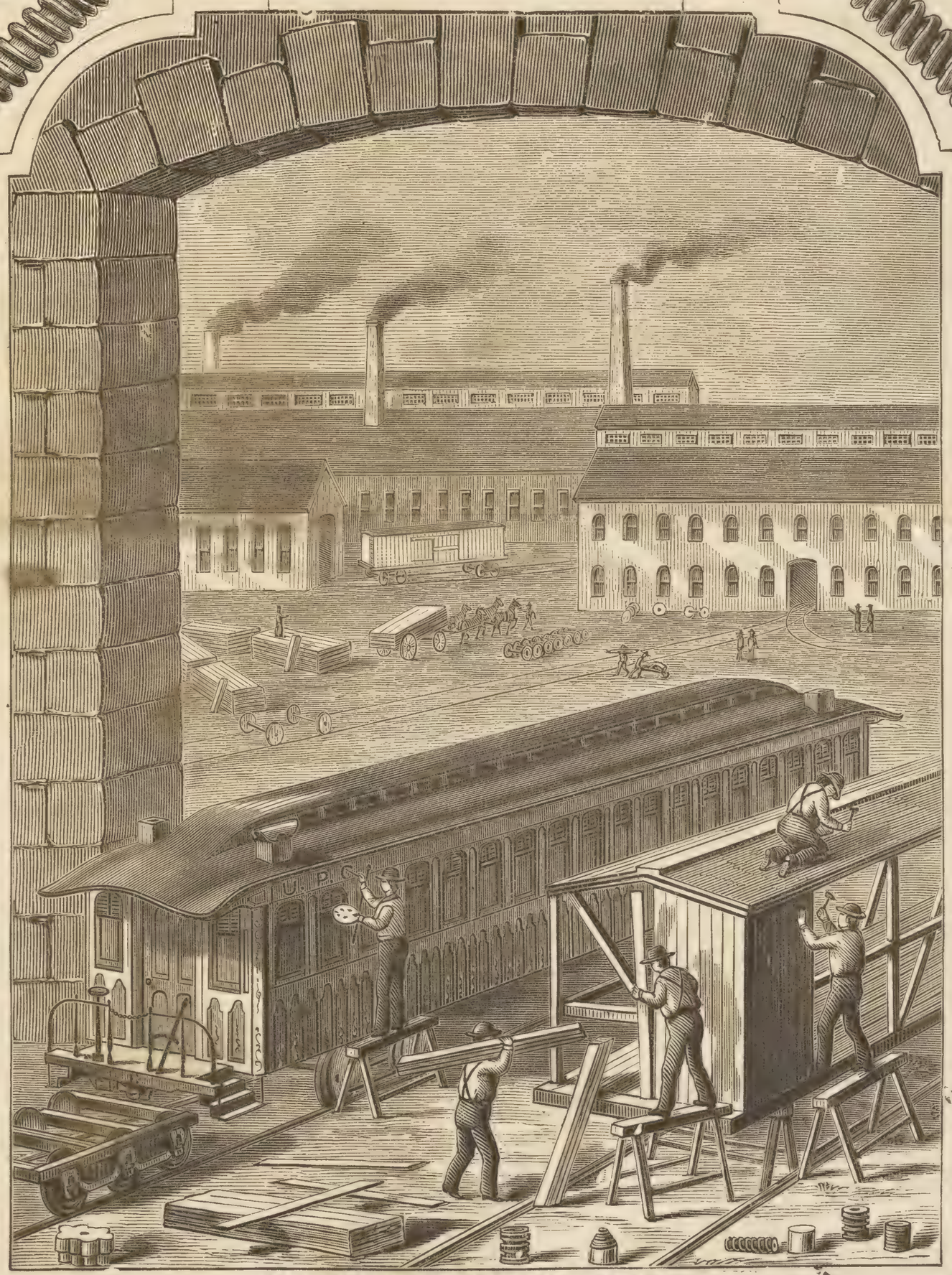

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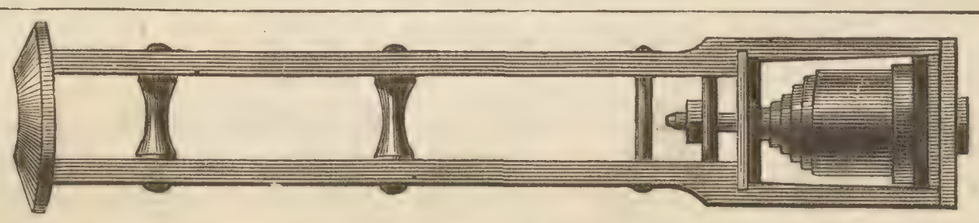

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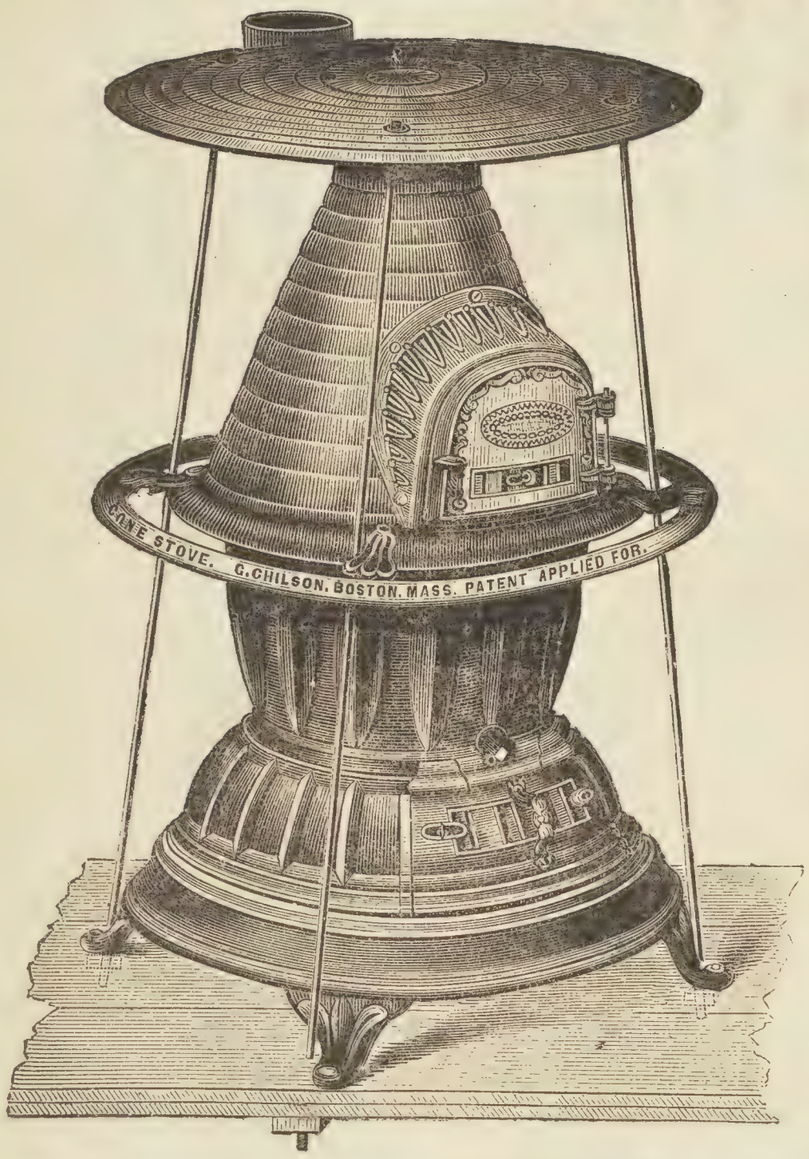

I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

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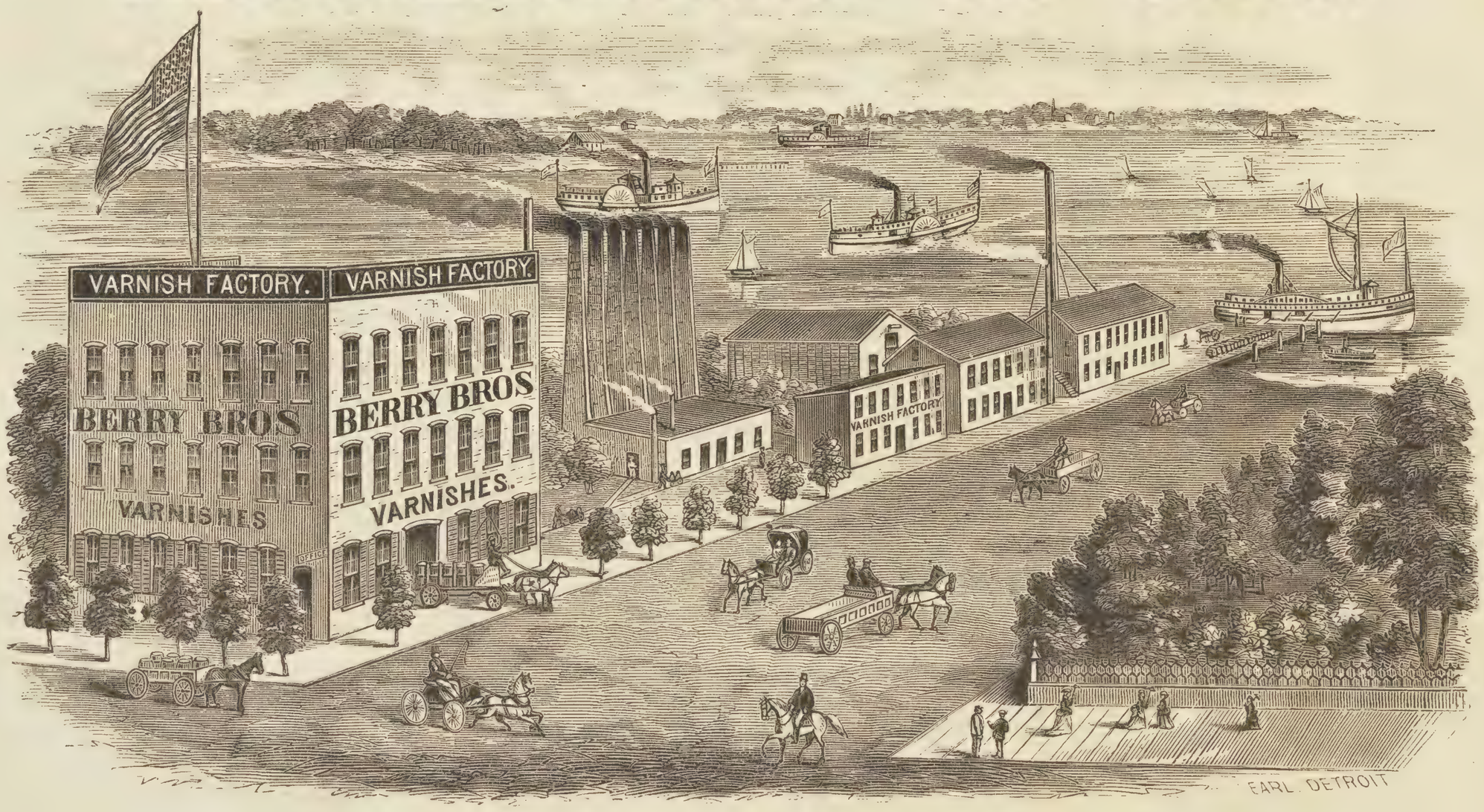

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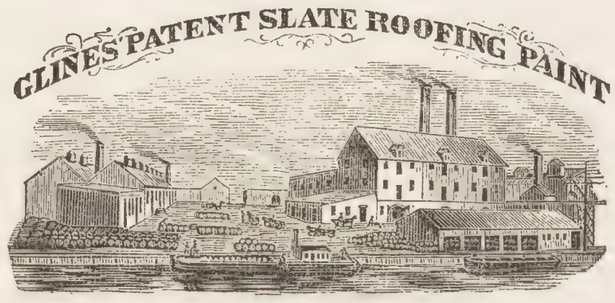

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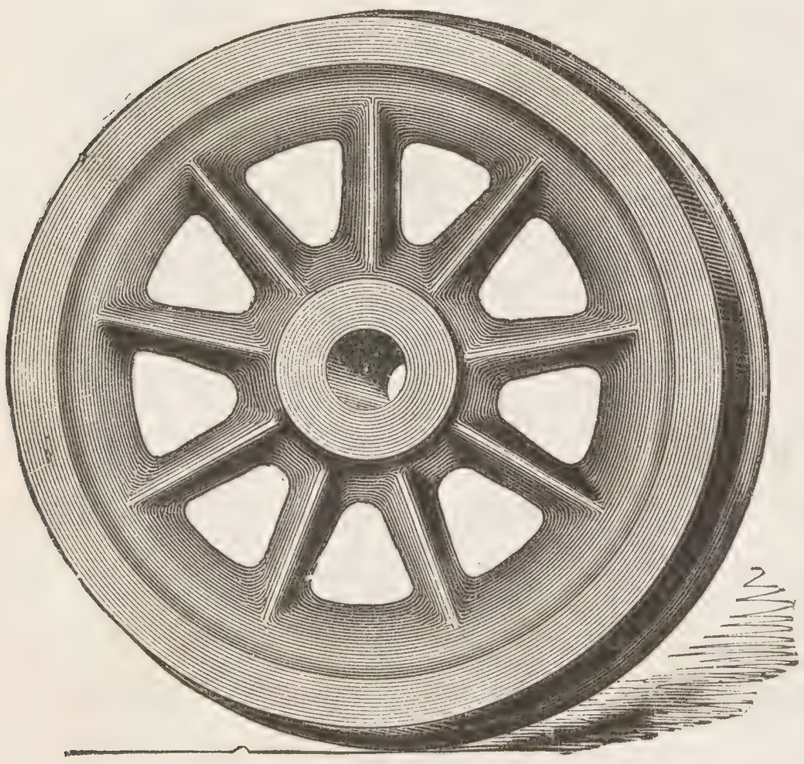

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First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins alone in a very short time.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address *William Todd,* or

WILLIAMS, PAGE & CO.,

BOSTON.

Standard Car Axle-Boxes, Housings, and Jaws,

SUPPLIED TO ORDER BY

FOUNDRY AND MACHINE COMPANY,

TAUNTON, MASS.

S. F. GATES, Agent.

FERRIS & MILES,

TWENTY-FOURTH AND WOOD STS., PHILADELPHIA, PA.

(Take Arch, or Race and Vine Street Cars.)

Steam Hammers, Drops, &c. Engine Lathes, Axle Lathes, Cut-off and Centering Lathes, Patent Screw-Cutting Lathes, Planing and Slotting Machines, Wheel Borers and Wheel Pressers, Upright Drills, with Patent Universal Tables, Radial Drills.

Scale in Steam Boilers.

I WILL REMOVE AND PREVENT **SCALE** IN ANY STEAM BOILER, AND MAKE NO CHARGE UNTIL THE WORK IS FOUND SATISFACTORY. ADDRESS, GEO. W. LORD, PHILADELPHIA PA.

FULLER, LORD & CO.,

Machine-Forged Nuts.

BOLTS and NUTS,

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139 Greenwich Street,

NEW-YORK.

NATIONAL

LOCOMOTIVE AND MACHINE WORKS.

DAWSON & BAILY,

MANUFACTURERS OF

LOCOMOTIVES.

Narrow Gauge Locomotives a Specialty.

OFFICE AND WORKS

AT CONNELLSVILLE, PENN.

Hitchcock Car Ventilator.

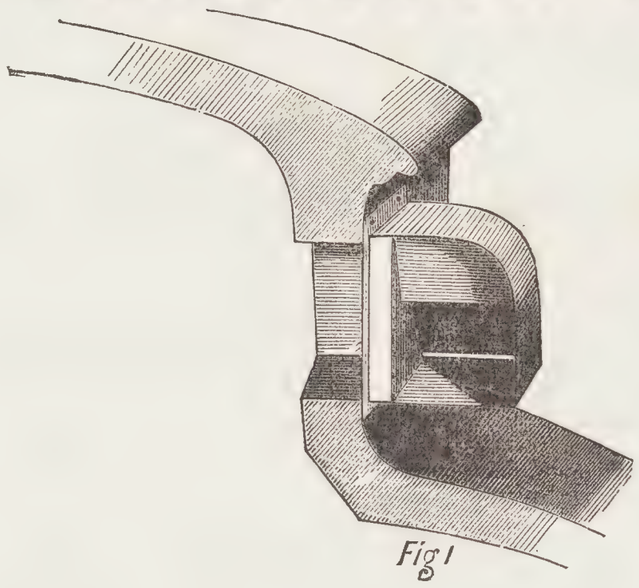


Fig 1

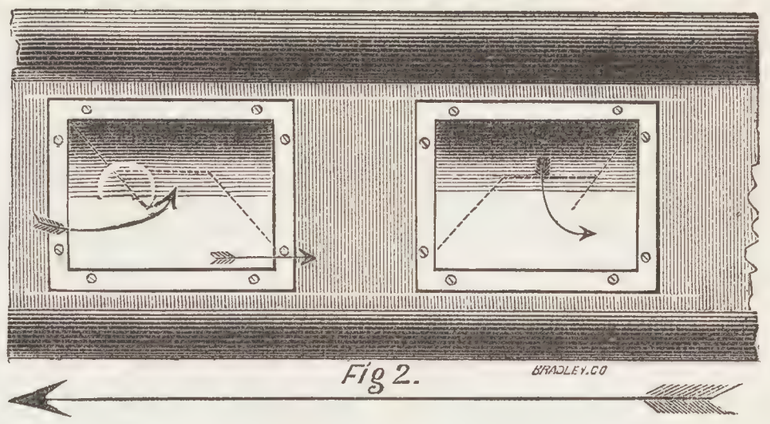


Fig 2. BRADLEY.CO

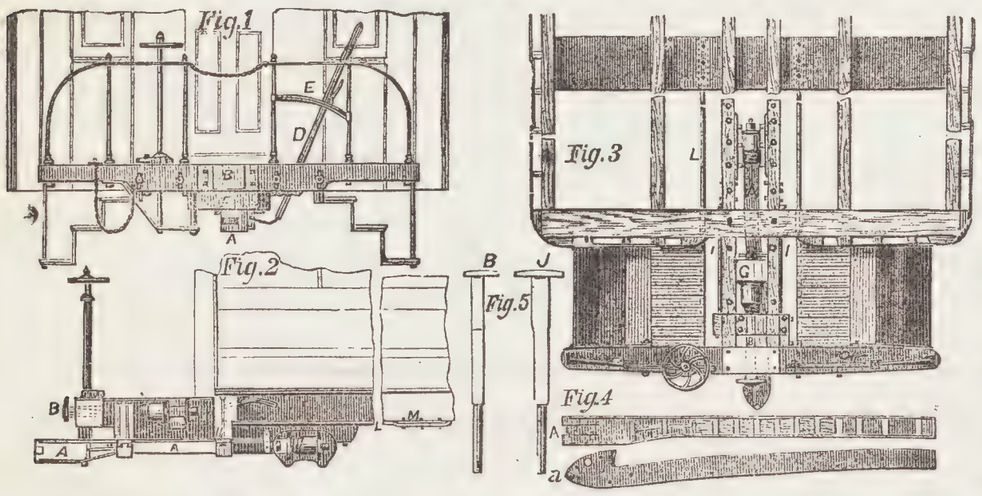
THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

H. D. CARROLL & CO., Springfield, Mass.,

Proprietors and Manufacturers.

ROBERT HITCHCOCK, Inventor.

MILLER'S TRUSSED PLATFORMS. Compression Buffers and Automatic Couplers for Railroad Passenger Cars.



Office, 231 Broadway, (Rooms 4 and 5,) New-York.

Send for Illustrated Pamphlet, and call and see working models. E. MILLER, Patentee.

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied: and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

DELAWARE CAR WORKS.

[Working Capacity, 1000 Men.]

Manufacturers of Sleeping, Saloon, Drawing-Room, Passenger, and Freight Cars of Every Gauge.

WANTED,

A SITUATION AS MASTER CAR BUILDER, by one who is thoroughly acquainted with the business, and can give the best of references.

Address, VOSE, DINSMORE & CO.,
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THE
PETERSBURG CAR COMPANY,
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Are now ready to receive orders for all kinds of

FREIGHT CARS.

These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.

JOHN W. FLEMING, Superintendent.
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FOR
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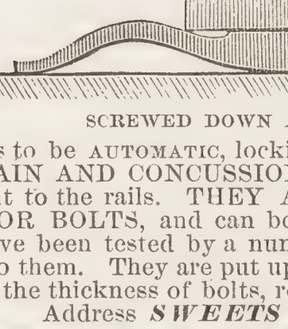
OVER FOUR THOUSAND NOW IN USE.



All Governors fully Warranted, and returnable in all cases where a trial does not prove its superiority over all others, as the **most Perfect, Reliable** and **Economical Steam Governor ever Invented.** It resembles, neither in principle nor in operation, any other Governor known. For Circulars of reference, or information, address

HUNTOON GOVERNOR CO.,
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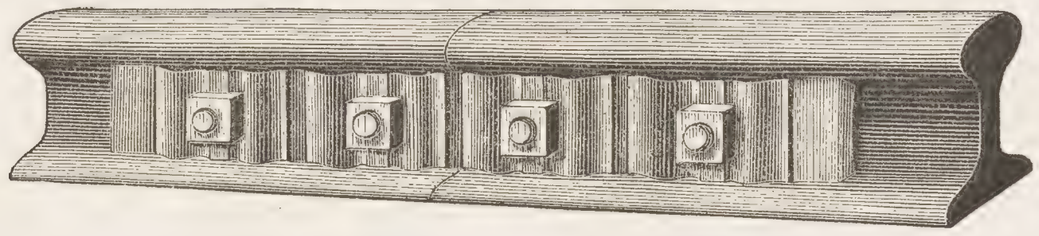
MILLER'S PATENT ELASTIC WASHER AND NUT LOCK,
FOR RAILROAD FISH JOINTS.



NUT SCREWED DOWN. SCREWED DOWN AND NUT LOCKED.

These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

Address *SWEETS MFG. CO., Syracuse, N. Y.*

ESTABLISHED 1827.

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MANUFACTURERS OF
VARNISHES
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WANTED.

A GENTLEMAN of 20 years' experience as a "Car Builder," wants a position as Master Car Builder on some Railroad. Can furnish best of references. Address

VOSE, DINSMORE & CO.,
32 Warren Street, N. Y.

NOYES' PATENT LIQUID PACKING,
For Cooling Railroad Car Journals and Bearings of all kinds.

What we Claim for it is:

That it will cool a journal while a car is in motion, and that its use will in a great measure prevent its occurrence, saving expense, delays, and accidents; that mixed with mineral oil it gives a soft, heavy body, essential elements which this oil lacks, especially in warm weather, besides keeping it sweet and preventing oxidation; that a journal will wear longer and with less friction, and be better and more thoroughly oiled; that the heat from the journal is thrown off at a temperature below that required to melt the babbitt, saving it from being destroyed, and preventing an accumulation of heat; that there is less liability of waste packing of journal getting on fire, as the non-inflammable elements of the Liquid permeate the waste and prevent it; that it will cause a considerable saving in the expense of oiling, as it imparts additional lubricating qualities, as well as body, which prevents waste from running off, keeps the journal smooth and polished, and hardens the bearings; that a trial will satisfactorily demonstrate its superiority to sperm and lard oil, and that used according to directions it is even cheaper than mineral oil, which is the lowest-priced lubricating oil in the market.

We do not claim the LIQUID PACKING as a *durable* lubricator of itself alone, but when used with good mineral oil, according to directions, we do claim that it constitutes a cheaper, better, and more durable lubricator than any thing offered for the purpose, under whatever name.

One thorough application of the Liquid on a hot journal will do more execution in cooling, than the constant application of water for half an hour, besides doing it evenly and without loss of time.

DIRECTIONS FOR USING:

FOR COOLING OFF A HOT JOURNAL WHEN CARS ARE IN MOTION.—For this purpose procure a can holding two gallons, the nozzle having an outlet of not less than half an inch, and always keep it well filled with the LIQUID PACKING for immediate use. When a hot journal is discovered, apply the LIQUID slowly, first giving the contents of the can a thorough shaking, and then proceed. Examine journal at next station, and if not cooled down to a proper temperature, apply again, and so on until it is accomplished, then fill up the box with native lubricating oil; this is particularly necessary in all cases where animal oil is used as a lubricant. In all ordinary cases this treatment will effectually cool off a journal in a short time, and without causing scarcely any delay of train. *Where a box is on fire*, pour on the LIQUID, which will extinguish the fire immediately. In extreme cases, where the babbitt metal has melted, or where journals are extremely rough, the journal may become hot again. If so, repeat application of LIQUID as directed, and then fill up box with native oil, and so on as often as may be necessary to the end of route. A can of the LIQUID PACKING, together with a can of native oil, will insure the safe delivery of cars troubled with hot journals, with scarcely any delay. A smoky and hazy emanation from boxes in which the LIQUID is used, simply indicates a rough journal, and that the heat is being conveyed away from it. In such cases look to it occasionally, and keep it well supplied with the LIQUID. Should the LIQUID become too thick to run freely from the nozzle of can, from the action of the weather, thin to the required consistency with mineral oil.

FOR A GENERAL LUBRICATOR.—Add one part of LIQUID PACKING to two parts of native West-Virginia or paraffine oil, and use in regular way. Or, if preferred instead, use the LIQUID PACKING in every third or fourth oiling, according to the temperature of the weather and quality of oil. Used in this way, aside from its cooling qualities, it makes a lubricator that can not be excelled in price and quality.

WHAT RAILROAD MEN SAY OF IT.

PERSON NOYES, Esq.,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent evaporation; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Bell and Leather Stuffing Co., CHICAGO, DEC. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

OFFICE OF NORTHERN RAILROAD,
MR. P. NOYES: CONCORD, N. H., May 26, 1872.

Dear Sir:—Send to this corporation a barrel of your LIQUID PACKING. The sample package cooled four hot boxes within a distance of eight miles. I shall have a can on board each train, for it gives perfect satisfaction. A. LANGMAID.

P. NOYES, Esq.: ALBANY, Nov. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report:

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

NEW-YORK, PROVIDENCE, AND BOSTON R. R. Co.,
BELT AND LEATHER STUFFING CO.: PROVIDENCE, Aug. 3, 1870.

Gentlemen:—Some two months since I received from you a can (1 1-2 gals.) of your LIQUID PACKING for cooling journal bearings on cars; I have just repaired and put to running an engine; the first trip the truck boxes (all new) heated badly. I gave the LIQUID PACKING to the engineer, and instructed him to use it according to directions. The consequence was that we had no more hot truck boxes. I was so well satisfied with it that I ordered a barrel, and for the past month, when we have a hot box on any of our cars, we apply at once your LIQUID PACKING, which has in all cases, thus far, cooled the journal so as to give no further trouble or delay. During the past two weeks we have received from the Taunton Car Co. four new passenger cars; the two first, when received by us from Taunton, had each journal *very hot*, with the babbitt metal melted out of brass shells; I renewed the metals and packed them with your LIQUID PACKING. The cars have been running 150 miles each day ever since, with *no more hot boxes.* Some ten days since we received from the N. L. & N. H. R. R., at the Ferry Boat at Groton, (through express train from New-York to Boston, shore line,) a car having a red-hot box; your PACKING was at once applied, cooling the journal so that the men were able in a few moments to put in a new metal; they then repacked with your LIQUID PACKING, according to your printed directions, and the car came into Providence, a distance of sixty-three miles, perfectly cool, without any further trouble. If it continues to work as well, I can not do without it. I cheerfully recommend it to all Railroads, as being an article which they will find invaluable in all cases of hot journals.

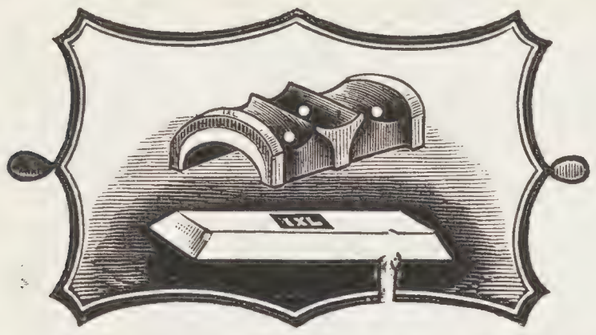
J. H. ANDERSON, *Master Mechanic.*

Send for a Barrel. No charge unless it does all we state.

Manufactured by the Belt and Leather Stuffing Co.,
47 INDIA STREET, BOSTON.

Sold by Vose, Dinsmore & Co., New-York.

ORGANIZED MAY 1869.



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Sole Proprietors and Manufacturers of the

I X L ANTI-FRICTION METAL

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Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.

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THE McNAIRY & CLAFLEN MANUFACTURING COMPANY, Proprietors,

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EITHER OF IRON OR WOOD.

Pneumatic and Screw-pile Sub-structures, Railroad Passenger and Freight Cars, Street Railroad Cars.

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Roofs, Turn-Tables, and Transfer-Tables

OFFICES—Waring Block, cor. Bank and St. Clair Streets.

WORKS—On Watson, Hamilton, and Lake Streets.

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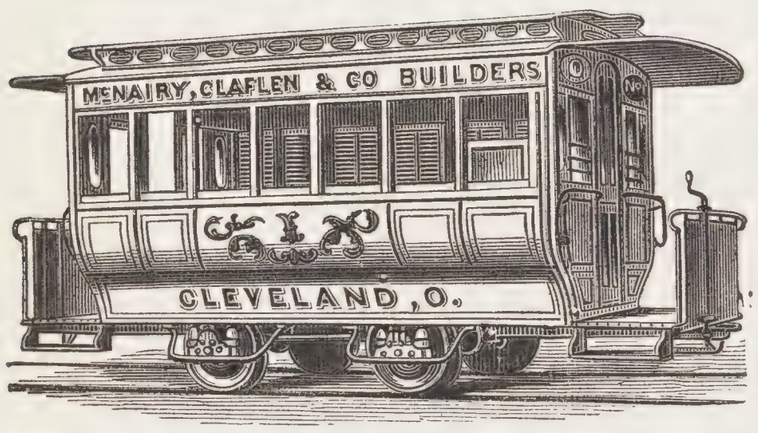
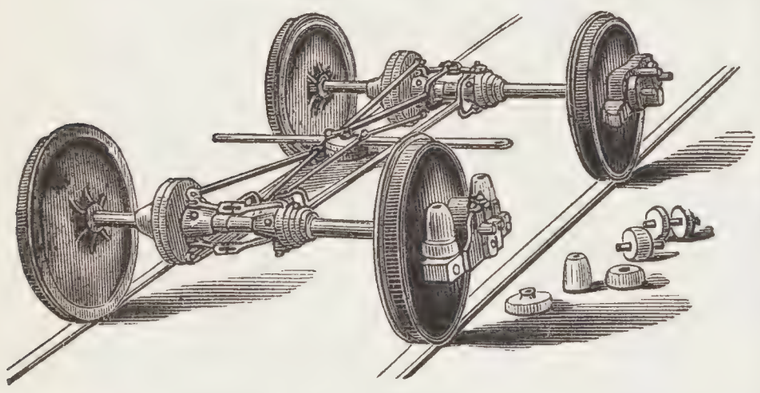


The Lightest Running, Easiest Riding, Most Durable, and Most Economical Street Car in Use.



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Address IRON CLAD PAINT COMPANY,

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This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

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OFFICE OF PURCHASING AGENT
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Very respectfully yours,
A. C. ARMSTRONG,
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COTTON DUCK,

For Car Covering and Car Seats,

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Maker and Patentee of

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BOILER TUBE EXPANDERS,

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Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

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ARE NOW PREPARED TO RECEIVE ORDERS FOR ALL KINDS OF

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These works, recently completed, are furnished with the very latest and best Machinery, and are prepared to furnish the better qualities of work with promptness.

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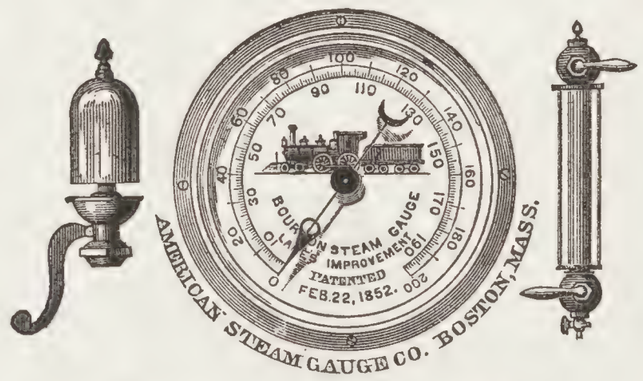

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Sole Proprietors and Manufacturers of

Bourdon Steam Gauge, with Lane's Improvement.

RICHARDS'S PARALLEL MOTION INDICATOR,

And all other Instruments for Measuring Steam, Air, or Water.

☞ Railroads having Gauges out of order, of any make, can send them to us, and they will be repaired and made as good as new, at a fair price

Send for Illustrated Catalogue.

A. N. CLARK, Treas. **H. K. MOORE, Sup t.** **GEO. MEACOM, Sec**

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CHARLES D. THUM,

No. 150 North Third Street,

PHILADELPHIA, PA.,

SOLE MANUFACTURER OF THE

Half Elastic Varnish Brushes

SUPERIOR TO ANY IN USE.

BRUSHES OF EVERY DESCRIPTION

On Hand, and Made to Order.

SEND FOR CIRCULAR.

THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

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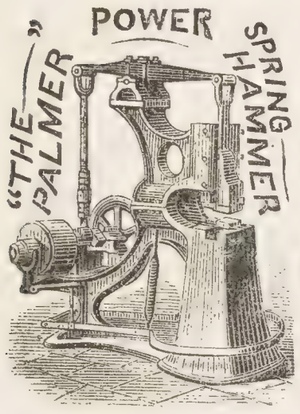

Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

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Who are also Builders of the

Abbe Bolt-Heading Machine.

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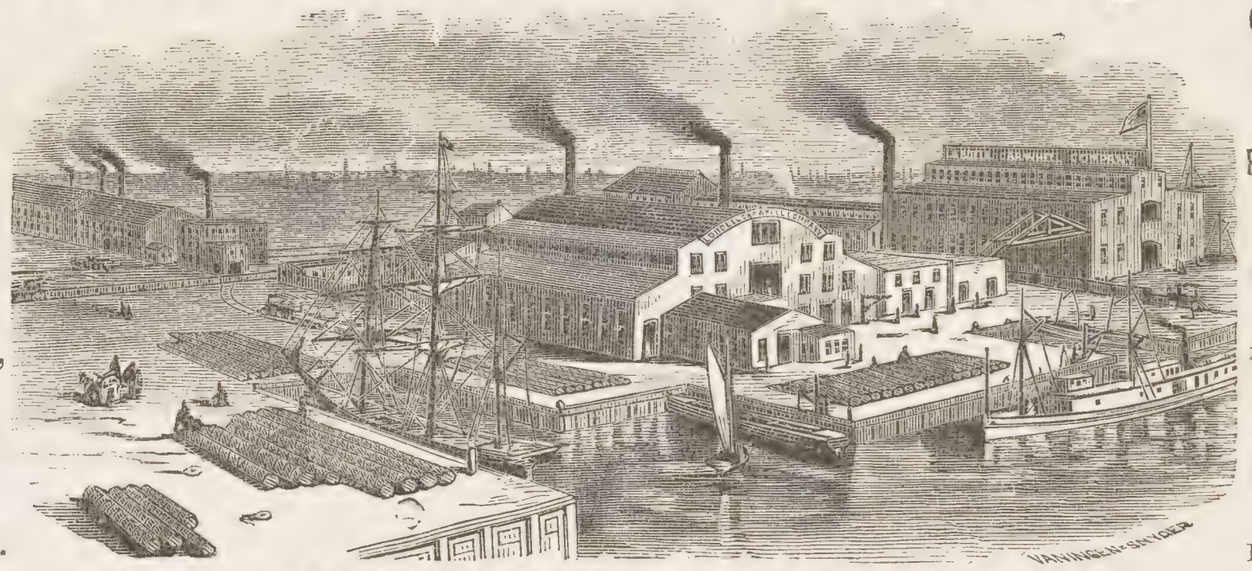

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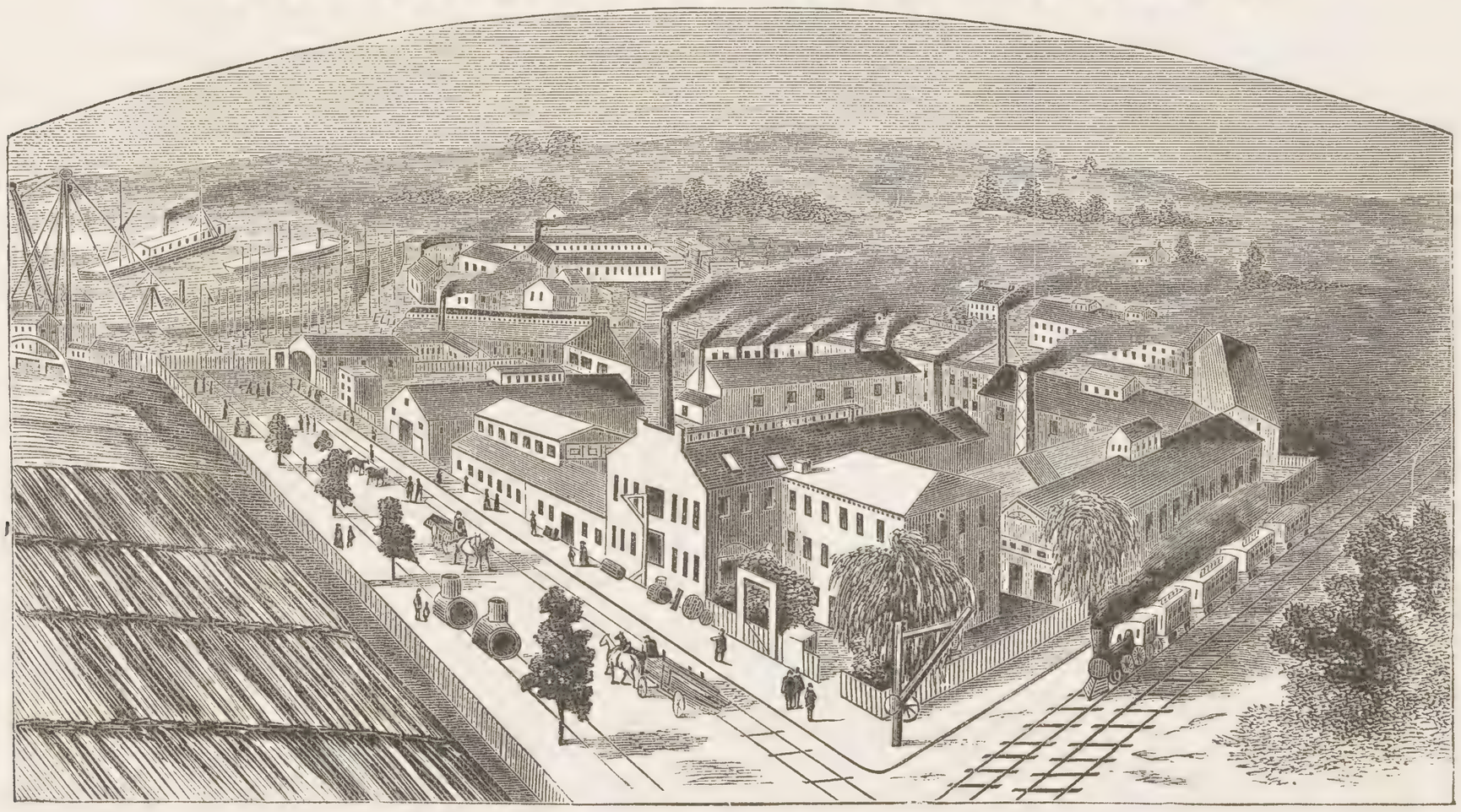

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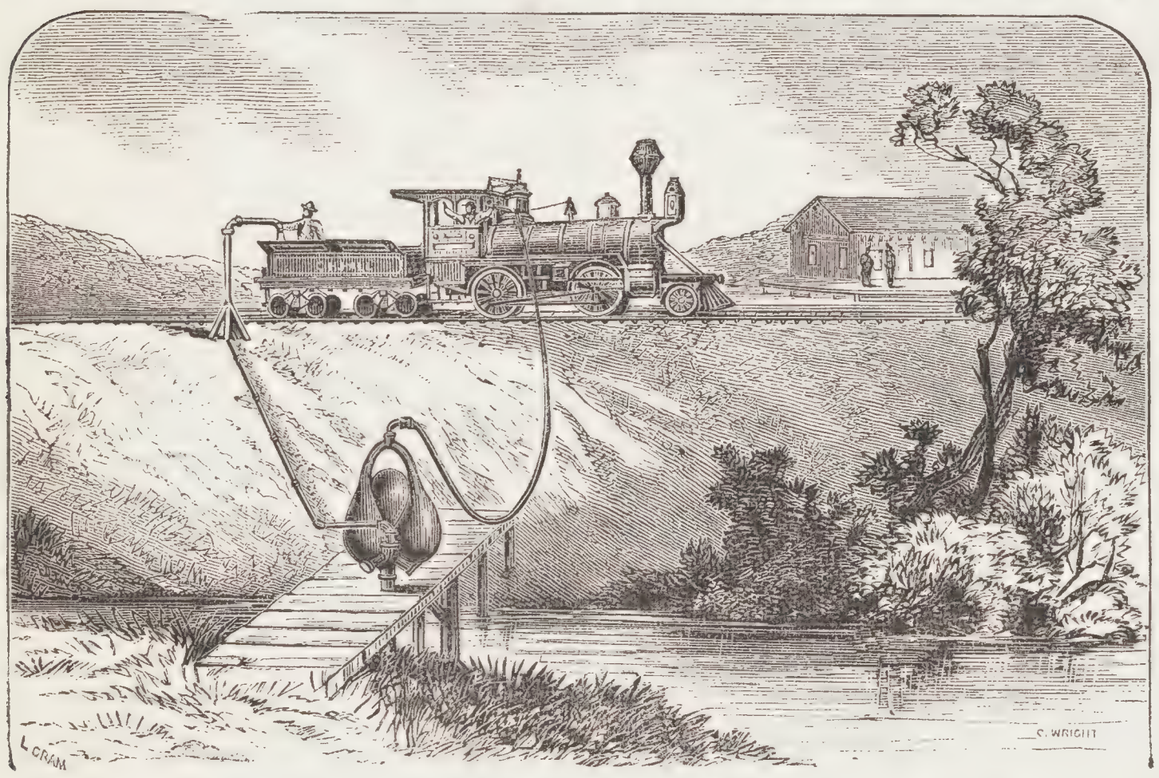

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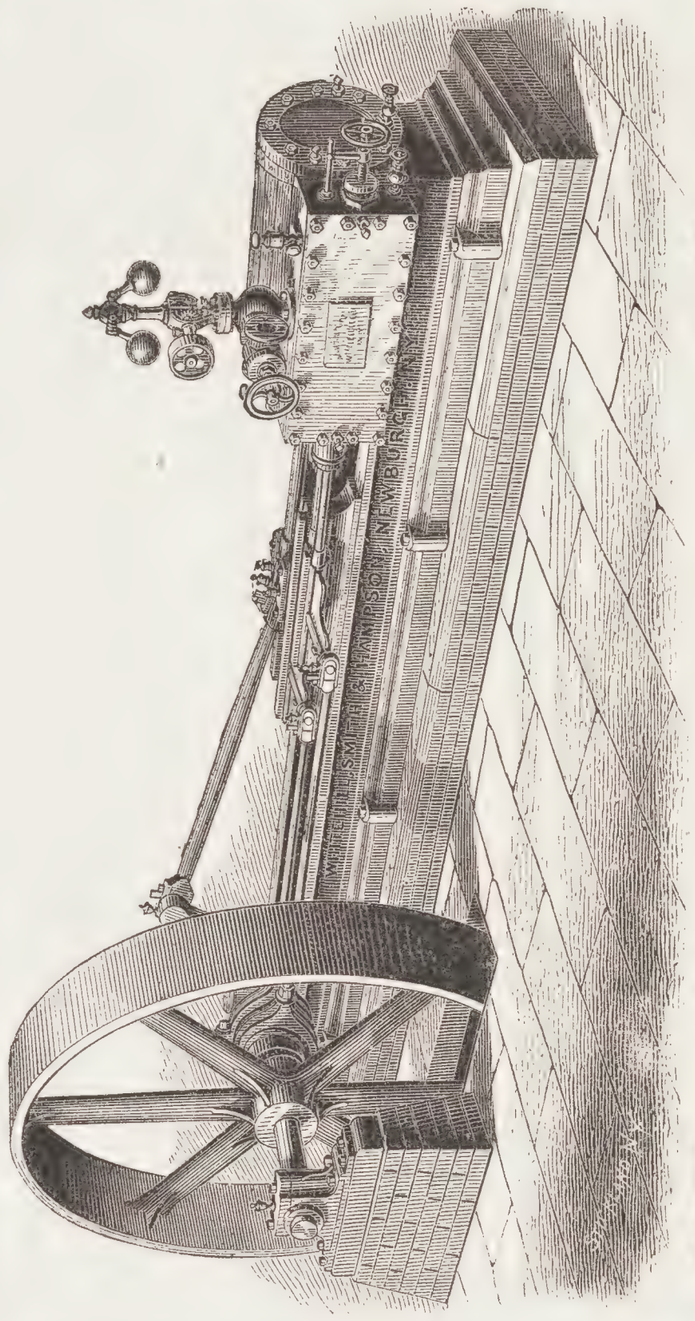

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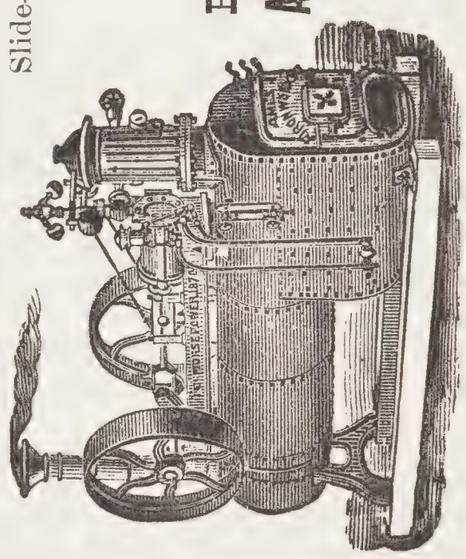

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Vol. V. / *No. 4.* — APRIL, 1874. — *One Dollar per Annum.* / *Single Copies, 10 Cents.*

Hot Journals, and How to Cure Them.

HOT journals are the dread of machinists and railroad men. They consume power, wear out the machinery rapidly, endanger property, and in the case of railroad travel, they produce the very difficulty which, above all others, is to be avoided—delay. And however beautiful they may seem to the scientist as illustrations of the conversion of motion into heat, they are any thing but beautiful in the eyes of practical men. The heating of journals is generally supposed to be caused by want of proper lubrication; but although this is the reason why very many journals heat and wear unduly, it is not the only cause of this unfortunate condition of things; and as a knowledge of the causes which produce any difficulty is a great step toward a knowledge of how to remove it, we ought first to give our attention to this point.

The heating of journals always arises from undue friction; and this excessive friction may be caused either by want of a sufficient amount of lubricating material; or by the use of a lubricator that is incapable of resisting the weight or pressure on the bearing; or by a want of due proportion between the surface of the bearing and the weight which it has to sustain; or by the use of an improper material in the construction of the journal or bearing. We suppose, of course, that in every case the journal is well finished and placed truly in line: any defects in this direction will produce heating, which is irremediable until the cause has been removed.

A very large quantity of lubricating material is undesirable. The old plan of pouring a large quantity of oil on the bearing every day without any device for applying it continuously to the rubbing parts, is a bad one, resulting in a waste of the lubricator as well as deficient lubrication during a great part of the time. No machinery can be run with economy that is not provided with apparatus which applies the lubricator continuously in small quantities.

It is a well-known fact, however, that bearings which support a great weight require a hard and firm lubricator; thin oil, such as is suitable for fine works, does not seem to answer. It is frequently found, however, to be very difficult to apply such hard lubricators properly, from the fact that they do not flow readily, and consequently it is not easy to keep up a continuous and moderate supply. With fine oil and ordinary bearings there is no trouble; but with bearings carrying such heavy weights as locomotives and railway cars the case is very different; and it requires all the ingenuity and watchfulness of the employees to prevent heating. The same is the case in regard to heavy planing-machines, though in this instance it is not so difficult to apply the lubricator. Where it can possibly be done, it has been found advisable to harden the lubricating material, either by the action of an alkali or by the use of some substance like plumbago. Of all the solid lubricators ever introduced, plumbago is decidedly the best, the only objection to its use being the difficulty of applying it. But even this difficulty has been overcome; and it is safe to say that its general introduction would produce a saving of thousands of dollars in the tear and wear of railway rolling-stock, and all kinds of heavy machinery.

Those who have studied the laws of friction know that it is pressure alone which regulates the amount of resistance offered by the friction between any two surfaces. This is well shown by the common experiment of laying a block on its flat side and drawing it along, and afterward placing it on its edge and dragging it over the same surface; the power required to move it will be the same in both cases, from the fact that the weight is the same. But while this important law holds good within wide limits, there are other influences which come into play when the surfaces are allowed to rub together for a long time, as occurs in the case of journals and their bearings. A journal that is overweighted may give very good results at first, but after a little time the molecular condition of the surface seems to change, and when this change has once occurred, lubricators seem to lose all power of remedying the evil. Every one knows the persistency with which a journal that has once been heated continues to get hot under all circumstances, and frequently we see men who ought to know better, setting a machine to work, although its journals have been heated, and no attempt has been made to dress them over. We grant that frequently it is a work of some labor and difficulty to remove a shaft from a machine and dress the journal, and various plans have been suggested whereby they may be dressed in their bearings. One of the best of these is to use some softish grinding material, such as bath-brick, which, after being reduced to fine powder, is to be mixed with oil, and poured over the journal. After allowing the journal to run for an hour or two, the brick-dust should be thoroughly washed out by means of oil, and after that there will seldom be any trouble. The same result may, however, be obtained by the use of plumbago, and with less risk of injuring the journal.

This change of molecular condition which occurs so readily in the case of iron, is not easily produced when the journals are of steel, and the introduction of this material will go far to enable us to avoid the evils arising from hot journals. We hope soon to see the time when steel will take the place of iron, not only in the case of fine machinery, but in the journals of the heaviest shafting.—*Industrial Monthly.*

TO case-harden $\frac{1}{32}$ of an inch, so that a file will not cut it, take prussiate of potash 3 lbs., carbonate of ammonia 1 lb.; pulverize and spread over the surface to be hardened with a metal or wooden spoon in the same manner as in the old method of potash hardening; put the article so treated into a spring furnace oven or on a blacksmith's fire, and kept at a cherry red heat for 15 minutes; then plunge it into a cold bath composed of 2 barrels of rain water, 10 lbs. of sal ammoniac, 10 lbs. of alum, and 5 lbs. of borax.

The Waste of Oil.

IF there be one thing more than another which is likely to be wasted about a work-shop, it is oil. This waste is not wanton, or even intentional, perhaps, but those who do not have to pay for oil seldom realize how important it is to economize it, and it is not often they know how to use it properly. It would not be extravagant, perhaps, to assert that half the oil used about machine-shops and metal-working establishments in general, is wasted. For example, if a workman wishes to oil his file for finishing, he will pour a stream over its surface, allowing two thirds or more to drip on the floor, when the file could be sufficiently moistened by a small bunch of waste or, better, a small sponge saturated with oil, without wasting a drop. If a hole is to be tapped in iron, whether cast or wrought, the workman too often prefers lubricating oil to patience and "elbow-grease," and pours on the oil until he saturates the substance or fills the pores of the iron. In ordinary cast-iron, a tap properly made and judiciously used, can be run without oil, or with a very small quantity, and in this work, as in many other processes, a saponaceous liquid is equally as effectual and much cheaper. It is an old and worn-out notion that almost every operation on the metals, and almost every use of a tool, must be accompanied with oil; neither is it correct that oil alone is a lubricant. Holes may be drilled and tapped, and surfaces finished without the use of oil, although some lubricant may be necessary. The addition of oil to an already clogged file, milling tool, saw, or rotary cutter, is not only a waste, but is no aid to the progress of the work. Either of them may be quickly and effectually cleaned either by wiping with waste, combing with the card, or heating over the forge fire; when they will do the work required much better than if they had to overcome the resistance of a body of viscid oil.

In the lubricating of shafting, also, great waste is occasioned. Where shafting is suspended in ordinary boxes, most of the oil leaves the journal almost as soon as poured into the box, and finds its way, dirty and fouled, into the drip-pan; once there, it is nearly worthless for shop use. Gummy, dirty oil, charged with foreign matter, and half oxidized by exposure to the atmosphere, although often used for tapping and screw-cutting, is unfit for even those purposes. It corrodes the taps and dies, and by its adhesive quality adds very considerably to the power required to do the work.

We might add other illustrations of waste of oil, or extravagance in its use, but this article is intended to be suggestive rather than instructive. Every manufacturer can, by investigation and experiment, find out what proportion of the oil used in his business is wasted, and by a judicious oversight he can usually effect an important economy in the amount annually consumed. It is economy, or a disregard of it, in such little matters that often makes the difference between profit and loss to a manufacturer.—*Metal Worker.*

The Master-Mechanics' Association Circulars of Inquiry.

THE following additional circulars have been issued by Committees of this Association :

BALANCE SLIDE-VALVES.

The Committee appointed at the last annual meeting of the American Railway Master-Mechanics' Association, on the subject of Balance Slide-Valves, beg leave to requestyour answers to the following questions, and any other information you may have on the subject.

1st. Have you had any experience with balance slide-valves? If so, please state fully what advantages they possess over the ordinary valve.

2d. Have you had any experience in changing the size of the ports under the same cylinder, in order to determine in practice what are the proper proportions of the size of ports to the size of cylinders? If so, state the result.

3d. What, in your experience, has proved to give the best results as to the amount of inside and outside lap?

4th. Please give the length of time and the number of miles run, and the condition of the valve-seat on the cylinder with the ordinary valve and also the same with the balance-valve.

5th. In your opinion, would it be advantageous to shorten the ports and widen the bridges so as to increase the wearing surface on the valve-seat of the cylinder?

6th. Please send a correct drawing of the balance-valve you have tried, and the name of the patentee.

Respectfully yours,
J. I. KINSEY,
Master-Mechanic, Lehigh Valley Railroad.
J. THOMPSON,
Master-Mechanic, Eastern Railroad.
G. H. TIER,
Master-Mechanic, Lake Shore & Mich. Southern Railway.

Please address replies to
J. I. KINSEY, South-Easton, Pa.

LUBRICANTS FOR LOCOMOTIVES.

The undersigned Committee, appointed by the American Railway Master-Mechanics' Association to report on the best "Lubricant for Cylinders and other Machinery of Locomotives," respectfully solicit answers to the following questions, and such additional information as in your judgment will be of advantage to the Committee in compiling a report.

1st. What is the best lubricant in use for valve-seats and cylinders of locomotives? Please state your preference, and your reasons therefor.

2d. Have you ever used any mineral oils, or mixture of plumbago, that you can recommend as superior to tallow or extra No. 1 lard oil?

3d. In your opinion, does the use of hard or soft water materially affect the value of tallow or oil as a lubricant, and if so, how?

4th. What kind of oil do you prefer for general use on locomotive bearings? If a mixture, how is it prepared, what are the ingredients, and what is the average number of miles run per pint or quart?

5th. What method do you regard the best for oiling valves, the self-feeder or the old plan of oiling with a can at regular intervals?

6th. The Committee will be glad of any other information you may impart on the subject of oils for rolling stock, and especially journal bearings of cars.

Respectfully,
JACOB JOHANN,
Chicago and Canada Southern Railway.
W. B. SMITH,
South-Carolina Railroad.
Committee.

Please send replies as early as possible to
J. H. SETCHEL, Secretary, Cincinnati.

COSTA RICA, though but an insignificant little republic, can perhaps boast of the most perfect railroad system on the face of the globe. Such things as collisions are totally unknown there—or at least, collisions more expensive than the running down of an occasional cow or of some drunken and half-naked Indian. Two trains have never been known to run into each other, and this immunity from disasters is perhaps partly due to the fact that there is but a single locomotive in Costa Rica.

THE Union Pacific Railroad will add to its rolling-stock during the present year, 10 new locomotives, weighing 38 tons each, 12 passenger-coaches, 200 box-cars, and 200 coal-cars. The box and coal-cars will be built at the works of the company at Omaha. No additions will be made to the car-shops and round-houses.

Lever and Spring Safety-Valves.

BY JAMES M. BLANCHARD.

I NOTICE, in recent numbers of THE CAR-BUILDER, sundry circulars, issued by committees of the Master-Mechanics' Association, soliciting information upon various topics which are to be considered at its next annual meeting. Although I am not at present a railway master-mechanic, and do not regard the questions contained in the circulars as being in any sense addressed to me personally, yet considering the importance of the subjects to which they relate, I trust I will be pardoned for submitting my views upon one or two of them. I propose first to consider the subject of the following interrogatory :

"What are your objections if any, to lever safety-valves?"

An intelligent answer to this question requires that the nature of the function to be performed should be clearly defined. It is to open and close an aperture in a steam generator so as to maintain the pressure as near the point at which the valve is set as possible. The valve in most cases not being designed to carry as much pressure as the generator can safely sustain, it follows that if one is used which is capable of rising from its seat when the pressure reaches the point indicated by the pressure-gauge, but which has not sufficient lift to allow the steam to escape as fast as it is generated, it then ceases to be a safety-valve in any proper sense of the term, and becomes a danger-valve ; and for the obvious reason that it is relied upon to perform a function which it is incapable of performing. The consequence is, that the increasing accumulation of steam becomes dangerous, and may reach the point of actual rupture. No intelligent engineer or mechanic will deny that a safety-valve, to be what its name implies, should be so constructed that when set to rise at say 80 pounds pressure, it should be capable of discharging all the steam the boiler can generate, whether the engine is working or not, and without permitting any considerable increase of pressure above the initial point. That the lever safety-valve will not do this, is a fact well known to all practical engineers. The writer has many times observed when running a locomotive on which the valve was set to blow at 80 pounds, that it would rise when the gauge indicated that pressure, but if the engine was standing still and making steam rapidly, the indicator would soon point to 100 pounds, and more, if the engine was not started or the valve raised by hand. This has been noticed and commented upon by hundreds of people, and will continue to be so long as the apparatus miscalled a lever safety-valve is retained in use. It is not a reliable instrument for the purpose to which it is applied, owing to inherent defects of construction. This may seem like a strong assertion, and a reflection upon the scientific knowledge of many engineers and mechanics, although no such reflection is intended. To test the correctness of what I have said, let us examine the device a little more critically.

It consists of a valve resting upon a seat around the aperture through which the steam escapes. A lever is pivoted to a stud or other device connected with the dome in which the valve is placed, its opposite end receiving a weight or attached in some way to a spring so adjusted as to regulate the pressure, the upper end or stem of the valve bearing upon some point between the weight and fulcrum. When the lever, its fulcrum, weight, and valve, are properly adjusted, the lever is supposed to be in a horizontal position, so that with a given distance between the fulcrum and bearing point of the valve against the lever, and with a pressure of say 300 pounds upon the whole surface of the valve, a weight of the same number of pounds would just balance the pressure upon the valve and yet leave it in contact with its seat ; but with a slight increase of pressure beyond that point, the valve will rise and lift the weight. As such a weight would in practice be inconvenient, the lever is lengthened and the weight removed further from the valve, thus giving it a leverage of ten to one or more Now suppose the distance from the lever fulcrum to the point where the valve-stem bears against the lever is three inches, and the distance from such point to the weight is 15 inches, it then follows that if the valve is to have a lift of $\frac{1}{16}$ of an inch, that part of the lever to which the weight or spring is attached must move five times as far, or $\frac{5}{16}$ of an inch. Now the inherent defect in this kind of valve is this. The moment the lever rests in an exact horizontal position, or is at a right angle with the valve-stem, a portion of the force required to lift the weight is transferred to the fulcrum of the lever, and is expended in an effort to lift the stud to which the lever is fastened, the consequence being that an increased resistance is offered to the rising of the valve from the instant it leaves its seat until it reaches its highest point ; and this, with the friction caused by the canting of the valve in its guides, hinders its rising sufficiently to liberate the steam as fast as generated. I have supposed a rise of $\frac{1}{16}$ of an inch, but in reality it is but a small fraction of this estimate, some of the English authorities placing it at less than $\frac{1}{100}$ part of an inch. But why this limited action? Would not the valve, with a weight directly upon its stem, rise more than this after being started? Most certainly it would, as the force which could overcome the inertia of weight and valve would keep on lifting until the force of the steam was diminished by expansion. The reason why lever valves do not rise so as to allow the steam to pass off beyond a certain pressure, is that the power which should be expended in lifting them is transferred to another point, as stated above, and this is a defect which can not be remedied by any known device. The next question is,

"What are the advantages or disadvantages of spring safety-valves?"

The advantages are, that they will, if properly constructed, relieve the boiler of all the pressure that may obtain beyond the limit at which they are set to rise, and that they can be depended upon to do this whether they are attended to or not. The principal disadvantage is the constant diminution of the strength of the springs ; but this can hardly be considered a valid objection, as the effect is so slight for a given period of time, and the change, small as it is, is on the side of safety.

STEEL AND IRON AXLES.

Another important question contained in the circulars is in reference to the comparative durability and safety of steel and iron axles, and as to whether the superiority of steel in these respects would compensate for the difference in cost. Now, if simply the *first* cost is intended, the question is not very difficult to answer ; but as the first cost can not be relied upon for determining the matter of economy respecting the use of steel, it is necessary to consider other elements of the problem. The relative strength and wearing qualities of the two kinds of metal are well known, as well as their ability to resist vibratory strains, but as my space will not admit an elaborate detail of facts and figures, I will only offer one or two general suggestions. Owing to the greater strength of steel, the axle may be considerably reduced in size and consequently in weight, so that its first cost will not much exceed that of iron with the same carrying capacity. The cost of transporting the additional weight of iron axles is the essential point, as it seems to me, which is to determine the question of economy. Assuming that a steel axle is 100 pounds lighter than a wrought-iron one, we save by its use 400 pounds to a car, or 12,000 pounds for every train of 30 cars. Estimating the cost of hauling this six tons of dead weight, (exclusive of paying freight,) at half a cent per ton per mile, a clear saving of $3 per train is effected for each hundred miles run, allowing nothing for less weight upon rails. Supposing the annual train mileage to be 40,000—which is considerably less than some trains actually made in 1873—we shall find that there is a saving in the cost of transportation of each train per year, of $1200. This would seem to indicate that steel axles are cheaper than iron ones.

Locomotive Head-Lights.

THE first head-lights used on locomotives were little more than large lanterns with common concave reflectors, sometimes designated as "barn" reflectors. In England, the first lights were provided with lenses for concentrating the rays upon the track; and in some parts of the world, the head-lights now used vary but little in their construction from large ship-lanterns. In this country, the necessity of a better method of lighting was made imperative upon our long lines of road running through unsettled regions and extensive forests, their tracks subject to only occasional inspection. To increase the size of the lenses was objectionable for two reasons—the liability of breakage, which increased with their size and weight, and the cost of glasses that would equal in

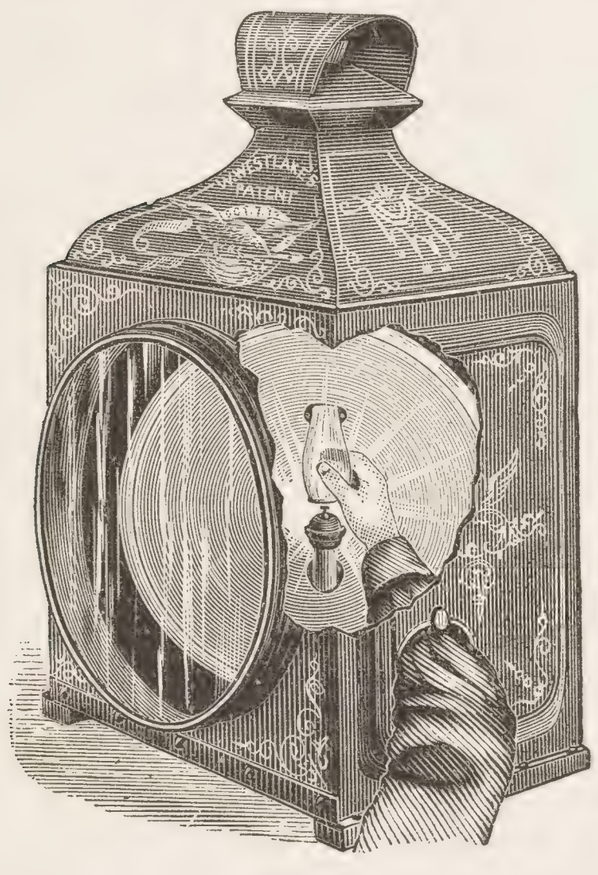


Fig. 1.

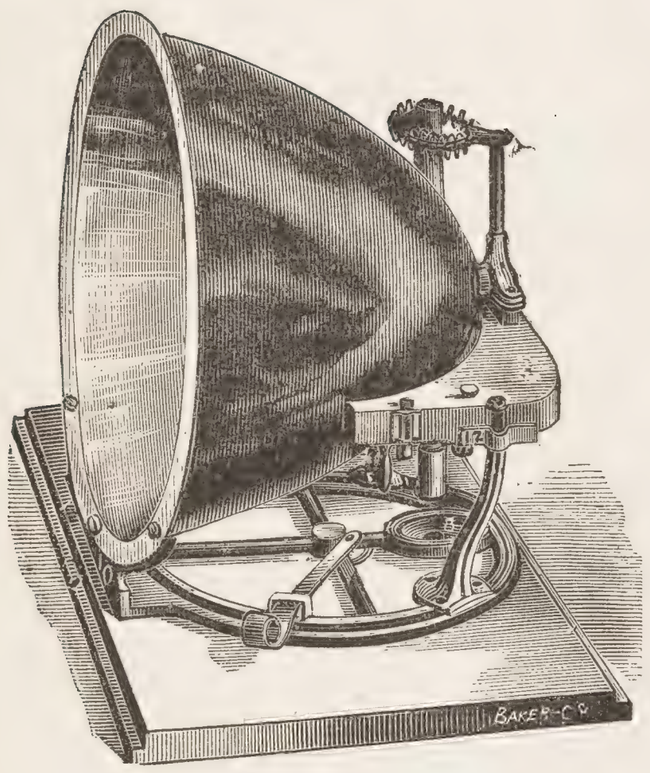


Fig. 2.

power large reflectors, the difference in such cost being from $200 to $300 in favor of the latter. In 1845, a head-light was in use on some of our Eastern roads, in which a very heavy reflector was used, hammered out of copper, and costing nearly or quite as much as large lenses. Some were also made about this time from speculum metal, cast in proper form and finished up on lathes constructed for the purpose. Hardly any thing better than this material for reflecting light could be obtained, it being the same as that used for telescope reflectors; but practically, it proved too expensive, as every time a chimney was broken, a part of the reflector would be melted by the heat.

The present style of reflectors is made of sheet copper worked into shape under the hammer. Wood formers of different degrees of convexity are used, the copper being hammered down into each successively, until the proper depth and shape are obtained; it is then placed upon a rapidly-revolving steel hub and "spun" up, until ready for plating. In this last process, it is absolutely necessary that there should be a positive thickness of plating metal, because the final polish is given in a lathe with a sharp-edged turning-tool which takes off an appreciable shaving. By a recent improvement, the size of the hole for the chimney has been reduced so as to be only ⅛ of an inch larger than the chimney, which materially increases the light. This is effected by the new chimney holder, which renders a larger hole unnecessary.

The cuts illustrate some of the latest and most valuable improvements that have been made, and by means of which numerous defects hitherto existing have been completely remedied. One of these improvements is Westlake's revolving apparatus, illus-

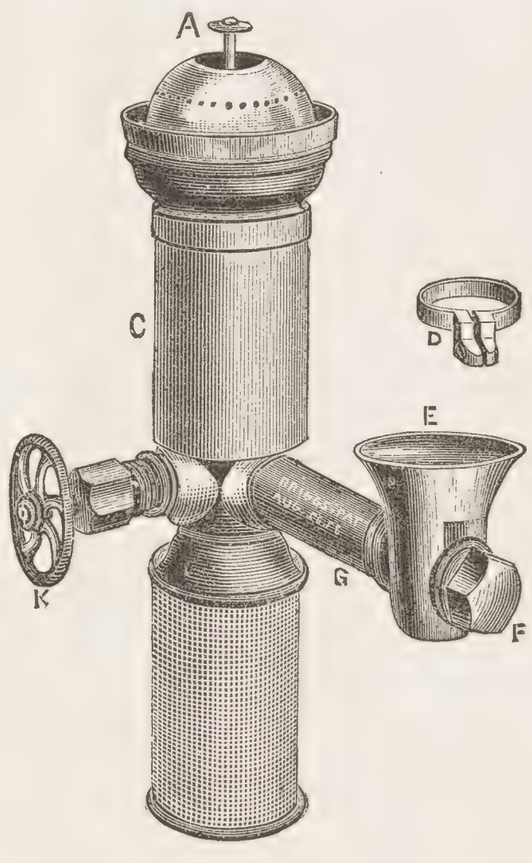
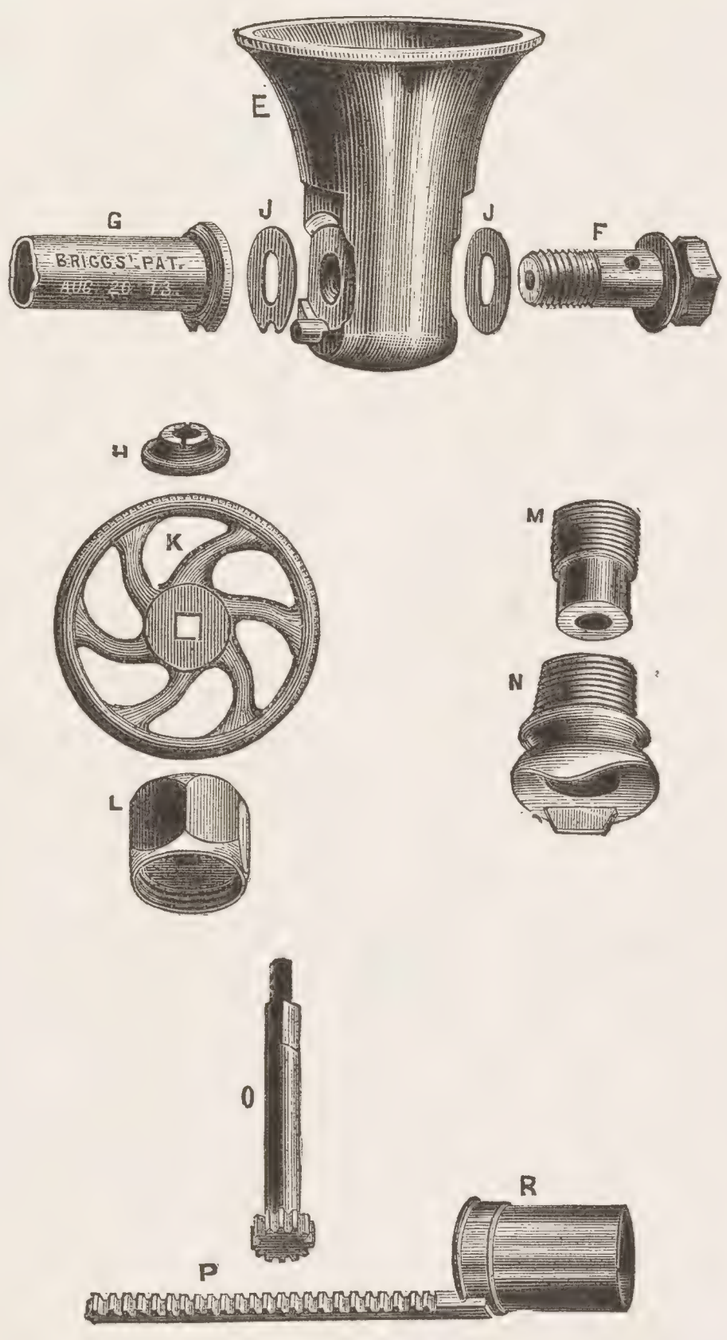


Fig. 3.



trated in Figs. 1 and 2, by which the reflector can be turned a quarter round for convenience of lighting or extinguishing, putting on chimneys, etc., all of which can be done with a great saving of time as compared with the old way, and without pulling out the slide-board or opening the door. The light can be put ou while the trains are waiting, and the burner instantly relighted, thus saving oil and the use of curtains. Fig. 2 represents the sliding-board, with revolving table, oil-tank, chimney-holder and 23-inch reflector complete. The oil-tank has an indicator attached, showing at all times the exact quantity of oil in it. Any of the parts can be duplicated without sending the whole to the repair-shops.

Fig. 3 represents Briggs's Adjustable Burner, the connection of which with the oil-tank is such that it can be removed when necessary and replaced by a new one. These burners are of two sizes, designated as "large and "small;" the latter, giving as good a light as the former, and requiring a much smaller hole in the reflector, materially increases the light. In case any minor part should fail, it can be replaced by a duplicate without sending to the shop for repairs or unsoldering any of the parts. The other cuts illustrate the detached parts of the burner and the improvement which has been made with respect to details. The letters refer to like parts in the several cuts, as follows: A button; C cap or cone and barrel; D adjustment fitting over wick tube for barrel to rest upon; E brass oil-cup soldered to tank and which also receives the burner; F hollow receiving-bolt through which oil passes to socket G, which is permanently secured to burner; H nut securing ratchet-wheel K to pinion G; J J lead washers; L stuffing-box nut; M part of stuffing-box; N stuffing-box receiver from which the plug M unscrews for inserting a new pinion without unsoldering the stuffing-box; P ratchet; R wick-tube. Each of these parts can be furnished by reference to the letters attached.

The casing of the Westlake revolving head-light is no larger in proportion to the size of reflectors than other head-lights. Special care is taken to make the reflectors as perfect as possible. They each have a plating equal to four dollars of silver, and are deeper and larger in measurement than most others. Messrs. Dane, Westlake, & Covert, of Chicago, are the proprietors and manufacturers, and Vose, Dinsmore & Co. are their New-York agents.

What an Able Writer Says.

AN able writer has said that a stated law is the supposed sovereign remedy for all public and social evils; but unfortunately even legislators are not infallible, and no sooner is the law passed than it is discovered that the evils which it was intended to cure have been greatly aggravated; at the next session the law is modified or repealed, new experiments are made, and although uniform failures for forty years have attended all efforts to regulate railroad transportation by legislative enactment, the effort is still continued. It is absurd to suppose that railway managers are arrayed in hostility to the public interest, that they seek to retard development, depopulate the territory tributary to their lines, and discourage the investment of capital. It is equally absurd to suppose that legislators, selected from all occupations and professions, are competent to settle questions of railway policy and economics, which require the most accurate and minute acquaintance with the circumstances and conditions of each particular line. Problems are continually presented for the consideration of railway managers which can not be solved upon general principles, but only by data peculiar to location, or to the circumstances attending a particular case. It can not for a moment be supposed that capitalists will invest money either in the stock or bonds of railroad companies if the value of the investment can be destroyed or imperiled by ever-changing and hostile legislation. Confidence would soon be destroyed, and no more railroads would be built unless government should assume their construction and operation, in which case, as all experience proves, they become agencies of wide-spread political demoralization, hospitals for broken-down politicians, and sinecures for pensioners of the dominant party.

Car-Shop Notes.

PITTSBURG, CINCINNATI, AND ST. LOUIS RAILWAY.

THIS line of road is often alluded to as the "Pan-Handle" route, because it crosses the narrow strip of West-Virginia lying between the western boundary of Pennsylvania and the Ohio River, the conformation of which, as it appears on the map, resembles a handle as applied to the old State of Virginia. The car-shops of this road, located at Steubenville, have been somewhat improved since our last notice of them in THE CAR-BUILDER of December, 1872, the improvements consisting of additional machinery of later and more approved styles, including a wheel-press, a wheel boring-mill, a self-feeding drill, a double-heading bolt-cutter, a double cylinder planer and matcher, a band-saw, heavy end-tenoning machine, etc. The mistaken economy of cheap machinery and little of it, is not practiced by this company in the fitting up of its shops. Six first-class coaches have been turned out of the car-shops during the past year, and two more are framed and ready to be set up. A variety of work is also in hand, including cars of different classes.

Two new coaches, in which Dripp's heater is used, have an arrangement for exhausting the foul air at the bottom, consisting of a tin pipe running from an oblong opening in the heater-box under every alternate seat to the car-wall, where the air escapes under the car. This is merely an experiment, the successful working of which remains to be seen.

Mr. James McGee, the late master car-builder, is now on the Houston and Texas Road, his place being filled here by Mr. Thomas Furgeson, formerly foreman of the freight-car department. As we have already mentioned in a previous issue of our paper, Mr. McGee was complimented on leaving the position he had so long and worthily filled, with the presentation of a gold watch and chain by his personal friends and associate employees of the department. Mr. Ross Noble succeeds Mr. Furgeson in the freight-car shop.

An ingenious mechanical device is employed at these shops for keeping the time of the men. It consists of a case or box about 2 feet long, 3 inches deep, and of a width corresponding to that of the roll-sheet. The sheet is placed in the box and moved upon rollers running crosswise. The names of the men in each gang are placed upon movable hinged pieces between the rollers and forming the top or face of the box, with a space between each over the centre of each roller. Each man reporting in the morning, has a mark like this ⟍ placed opposite his name on the narrow portion of the roll-sheet which appears in the spaces; if he reports at noon, another stroke is added, forming a × which signifies a full day; any thing less than full time is indicated by figures representing the number of hours, placed in the upper or lower angle of the cross, the former for forenoon and the latter for afternoon. A slight turn of the rollers gives a new blank for each day. By this method, each man can see his record made at the time, and no alteration is permitted afterward.

In one respect, this road, as well as others that might be mentioned, is somewhat behind the age in its passenger equipment. We allude to the continued use of the old-fashioned, objectionable style of platforms, while the superior advantages of the more modern safety-platforms are apparent on every hand. The costs of repairs and settlement of claims of injured persons growing out of telescoping collisions, very clearly demonstrate the folly of using the old style platform, one accident often costing enough to equip all the trains of a road with some one of the new styles. Considerations of safety alone should be sufficient for their universal adoption.

CLEVELAND AND PITTSBURG RAILROAD.

This road has constructed several new buildings within the past year. The principal shops are at Cleveland, where all the new work is done and all repairs for the main line. A half-circle round-house has recently been completed, but which does not by any means furnish the needed capacities required for the work done here. The shops are inconvenier tly crowded. It was contemplated by the company to commence this spring the erection of extensive locomotive and car-shops, but the undertaking has been abandoned for the present. Five new coaches have been built here during the past year, three of them 42 feet long and two 52 feet long. The former is the standard length for the road, rendered necessary by the numerous curves. Six 4-wheel cabooses, 211 gondolas, 43 stock, and 7 box cars, have also been built. There are only about 30 men employed in the car-shop. The road has also had 300 gondolas built at contract shops. The locomotive department, in addition to the regular repairing, has built 6 new freight engines. Six others have also been added to the road equipment, 4 from the Baldwin, and 2 from the Pittsburg Locomotive and Car Works. Mr. N. E. Chapman, the efficient master-mechanic, has his head-quarters at these shops. Mr. William Terriff is the assistant master-mechanic; Mr. William Rhodes, foreman of machine-shop; Mr. William Johnson, foreman of blacksmith shop; Mr. Bishop, master painter, and Mr. Samuel Johns, chief clerk, all having been connected with the shops ever since their construction. At Wellsville, 47 miles west of Pittsburg, are the shops of the River division, consisting of a round-house, car and machine-shops, all well-built substantial structures. Little is done at Pittsburg except in the way of light running repairs. There is a splendid round-house at Manchester, a suburb of Pittsburg.

Pullman Palace Cars in England.

THE *London Railway Service Gazette* contains an account of a trial trip recently made on the Midland Railway with two Pullman cars, named respectively "Midland" and "Leo," for the purpose of exhibiting to railway men the improvements in traveling effected by the system which has been so extensively introduced upon American roads. A select party of about twenty, including gentlemen connected with the railway press, and others interested in Russian and other foreign railways, were present upon the invitation of the Pullman-Palace-Car Company. One of the cars was a "sleeper," and the other a "parlor" car, both elegantly fitted up and provided with all the conveniences for day and night travel with which the traveling public are so familiar in this country.

The above-named journal congratulates the traveling public upon the adoption of the Pullman system in England, and characterizes it as "a device to increase railway traveling by supplying the obvious want of more luxurious cars; to save time by allowing night-traveling and long continuous journeys in all seasons without fatigue and loss of sleep; to avoid the delay, inconvenience, and expense of changing cars, without the objectionable alternative to the railway companies of letting their cars go off their own lines; to restrict the society of passengers to a more select class, and to encourage the taking of first-class tickets; to provide responsible agents to whom may be intrusted the charge of ladies, children, and invalids, from the beginning to the end of a journey; and to increase the protection of human life by providing cars capable of resisting the usual effects of collision, etc.

"That these expectations have been realized is best illustrated by the success of the 'Pullman Palace Car Company.' Beginning in 1867 with but 37 cars, it has now in successful operation about 700, of which 119 were added last year. These cars traverse all the principal lines of railway in America, and the company's contracts cover a mileage of upward of 30,000 miles. Upon these lines traveling has increased largely, and journeys of business men are almost entirely confined to the night, thus avoiding the tedium of oft-repeated journeys, saving valuable time and expense of hotels. Much of the business heretofore done by correspondence, is now more satisfactorily and quickly accomplished in person. Pleasure-traveling on the part of families has there become a prominent feature of railway business."

Then follows a summary of the contract made with the Midland Company, which is similar to those made with our own roads, and considered by the *Gazette* as very favorable for the railway company.

Since the above trial, another more imposing and complimentary one has been made, in which seventy journalists participated, including a representative of the *Times*. A brief cable dispatch is all the account we have of this more recent event; but it may safely be assumed that Pullman Palace-Cars have at last become a feature of railway traveling in England, and we predict that they will be so well appreciated that the traditional conservatism and distrust of innovation for which the English people are noted, will gracefully yield the palm of superiority to Yankee invention.

The Pacific Railroad Snow-Sheds.

COVERING the track for thirty-five miles, are massive arched galleries of large timbers, shady and cool, blackened with the smoke of engines, sinuous, and full of strange sounds. Through the vents in the roof and the interstices between the roof-boards the sunlight falls in countless narrow bars, pallid as moonshine. Standing in a curve, the effect is precisely that of the interior of some old Gothic cloister or Abbey hall, with the light breaking through narrow side-windows. The foot-step awakes echoes, and the tones of the voice are full and resounding. A coming train announces itself miles away by the tinkling crepitation communicated along the rails, which gradually swells into a metallic ring, followed by a thunderous roar that shakes the ground; then the shriek of the engine valve, and, in a flash, the engine itself bursts into view, the bars of sunlight playing across its dark front with kaleidoscopic effect. There is ample space on either side of the track for pedestrians to stand as the train rushes past, but it looks as if it must crush every thing before it, and burst through the very shed. The approach of a train at night is heralded by a sound like the distant roaring of surf, half an hour before the train itself arrives; and when the locomotive dashes into view the dazzling glare of its head-light in the black cavern, shooting like a meteor from the Plutonic abyss, is wild and awful. The warning whistle, prolonged in strange diminuendo notes that sound like groans and sighs from Inferno, is echoed far and long among the rocky crags and forests.

Mistakes of Civil Engineers.

PRESIDENT WHITE, of Cornell College, makes the following strong assertion in a recent lecture:

"Another great department bearing on a multitude of industries, directly and indirectly, is civil engineering. Take one among the fields of its activity. We have in the United States about 70,000 miles of railway, and every year thousands of miles are added. I do not at all exaggerate when I say that millions on millions of dollars are lost every year by the employment of half-educated engineers. Proofs of this meet you on every side. Lines in wrong positions, bad grades and curves, tunnels cut and bridges built, which might be avoided. All of us know the story. But this is not all. Hardly a community which has not some story to tell of great losses entailed by bad engineering in other directions. Here, it is the traffic of a great city street is interrupted for a year, because no engineer can be found able to make the calculation for a 'skew arch' bridge, a thing which any graduate of a well-equipped department of engineering can do; there, it is a city subjected to enormous loss by the failure of its water-supply system, because the engineer employed made no calculation for the friction of water in the pipes; in another instance, it is a whole district sickened by miasma, because a half-taught engineer was intrusted with its drainage. We must prepare men for better work, and for every dollar thus laid out, we shall create or save thousands. Nay, we

shall save lives as well as money. Mr. Baldwin Latham, in his recent book on Sanitary Engineering, and Dr. Beale, in his work on Disease Germs, show by statistics that a proper application of engineering to sewerage would save one hundred lives yearly in Great Britain alone, and the same truth holds in this country."

Passenger Register for Street-Cars.

A NEW apparatus for checking the receipts of street-car conductors is in use on one of the London street lines, and consists of a neat gate across the door that moves in or out with ease by the person entering or leaving. This gate is connected, under the platform of the car, with the lower end of another—a slide-gate—which passes behind, and follows the passenger in or out, as the case may be, and thus prevents two persons entering or leaving, and registering at the same time. The gates are evenly balanced, so that no impediment is offered to the passenger, and entering and leaving the vehicle are quickly done. A brass box, locked, contains the register, and is attached to the apparatus. Strips of paper inside the box, of the kind used in electric telegraphy, pass round two brass reels, and are moved by the apparatus. The passengers are noted by prickers passing through the paper at regular distances as the passengers enter and leave, the upper line indicating those who enter, and the lower line those who leave; the division of fares at each station is noted by blank spaces on the paper between the holes made by the prickers. This may be effected by either of four methods, two of which were shown on the car in operation separately. The first is by "crowning" the road at the stations from which the fares are charged. The road is gradually raised about an inch above the ordinary level, the rise being almost imperceptible. A wheel, of about 6 in. diameter, is placed under the car and is attached to levers connecting with a box containing an air-tight chamber, with a tube leading to another chamber in the registering box. The movement of the wheel over the crowning portion of the road, presses the air-chamber, and causes the air to pass into the chamber in the registering box. The space on the paper showing the station is thus made apparent. The other mode is effected in a similar manner, by the conductor pressing a knob; the movement by the force of the air is produced in the same way. If he omits to press the knob at the proper station, the larger fare would be recorded against him. By the latter method, the crowning of the road is not necessary. A very ingenious invention for noting the number of times the conductor enters the car is contained in a small box inside the car. This, also, is worked by means of the atmosphere.

A BILL is pending in the Legislature of New-York providing for a State Board of Railroad Commissioners. It was drawn by the committee on legislation of the New-York Cheap Transportation Association, and is nearly identical with the laws now in operation in Massachusetts.

A NEW-YORK Central special train, carrying several officials of the road, ran the eighty-one miles between Syracuse and Rochester in ninety minutes, the other day. We should call that pretty fast traveling.

Iron Freight-Car Truck.

THE engravings represent in outline the style of freight-car truck used on the Hartford, Providence and Fishkill, and some other roads. Although in its general features it is no novelty, and may be regarded by some as old-fashioned, it is nevertheless considered in some quarters as a very serviceable truck with the modifications that have been introduced and which are imperfectly shown in the cuts. These are copied from a drawing of a standard platform car of the above-named road, furnished by Mr. V. D. Perry, the master car-builder. Fig. 1 is a combined half end-view and cross-section between the wheels; Fig. 2 is a side elevation. Scale $\frac{3}{4}$ inch to the foot.

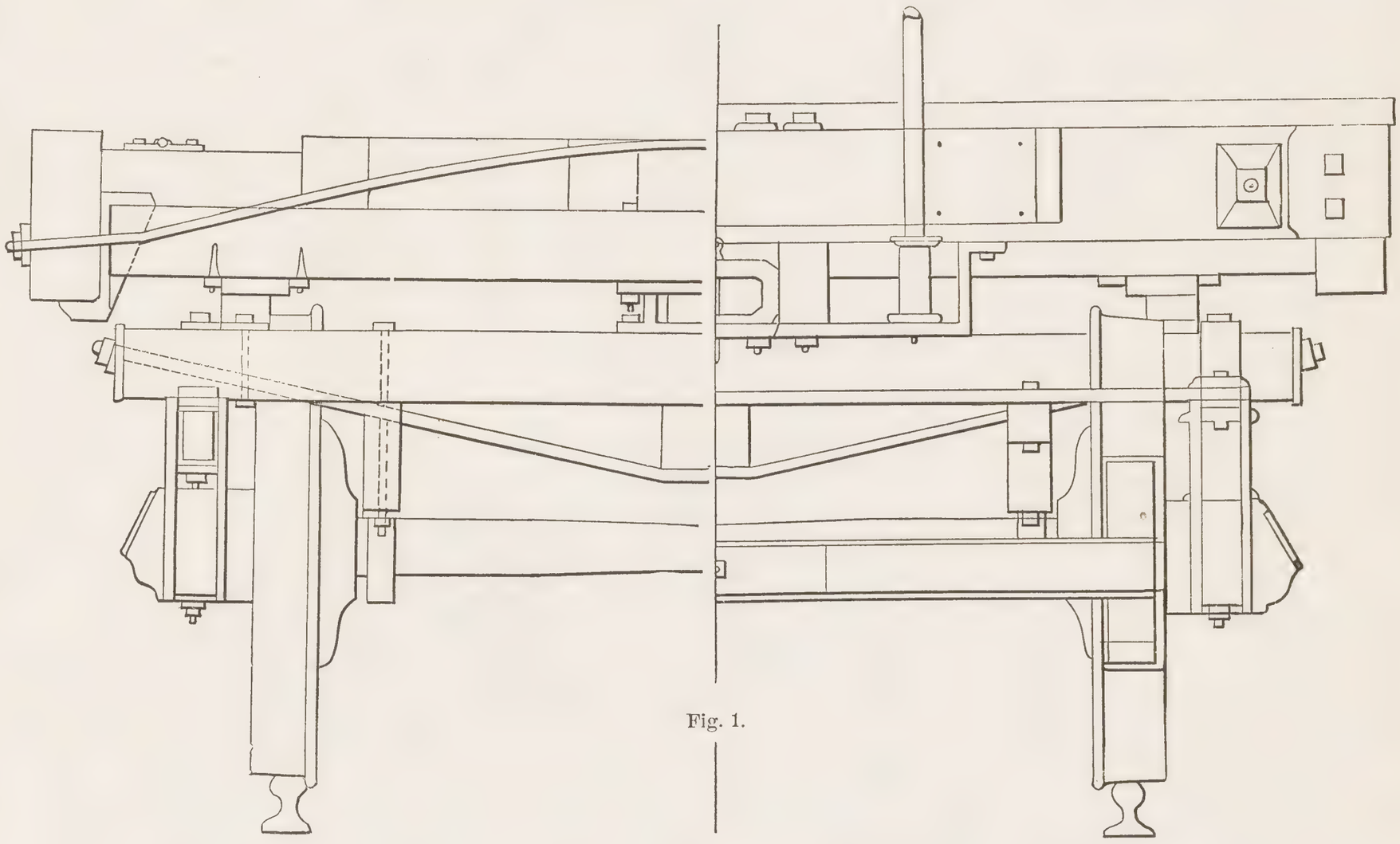


Fig. 1.

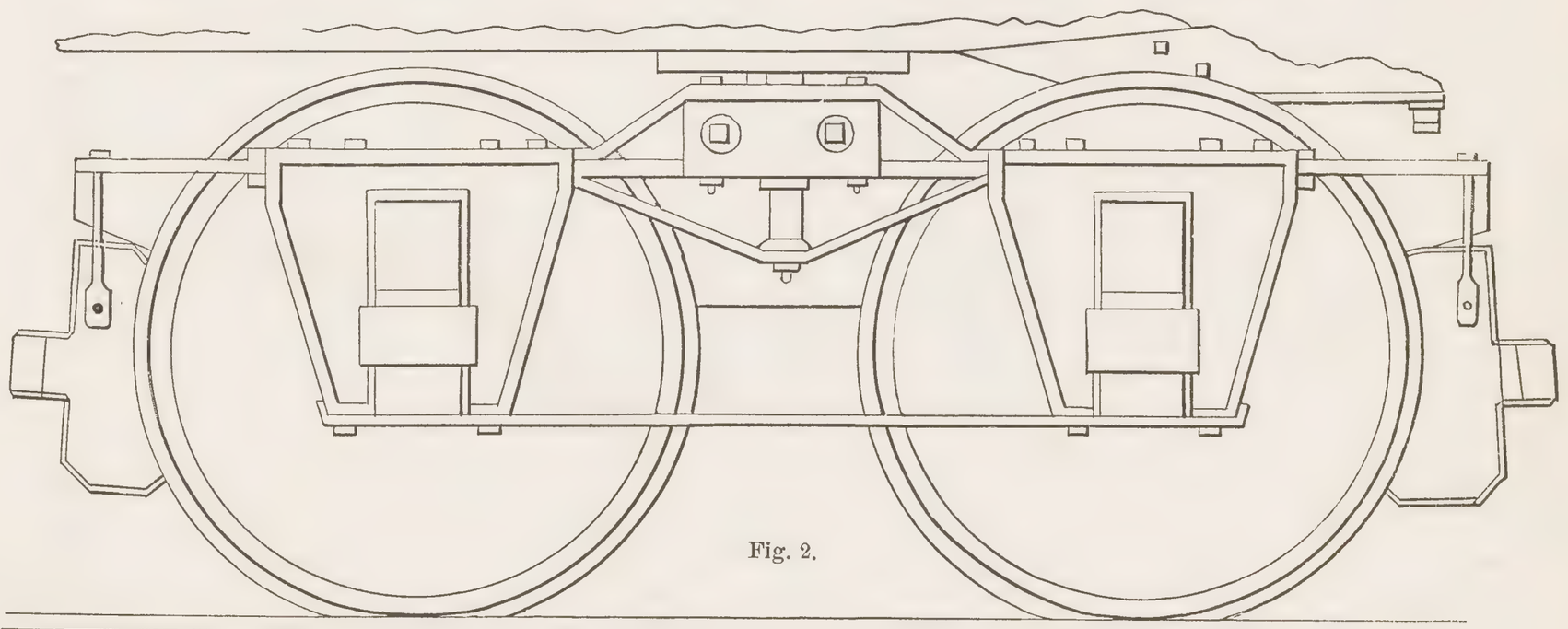


Fig. 2.

The frame is a continuous iron bar, 1 x 3 inches, with transoms and safety-beams of wood, the former 5 x 12, and the latter 9 x 3½ inches, with the usual safety-straps. The ordinary jaw with journal-springs can be used, and, when necessary, the transoms can be doubled and a swing-beam put in. The solid iron bar, with the diamond side-trusses and safety-beams, give the frame great stiffness, so that when thrown from the rails it does not become such a complete wreck as to necessitate heavy and costly repairs. The brakes are carried from the truck frame by means of the ordinary links, although the links are omitted in the drawing. The hanger-nuts, if properly screwed down, will not work loose. The best plan is to give this work to one man who will do it thoroughly and be held responsible for any mishap that may occur from the nuts being lost. The wheel base is only 3 ft. 10 in., which is considerably less than the track gauge; but it need not necessarily be so short. The car-body bolster, it will be observed, is not mortised into the side-sills, but is embraced by an angle-iron casting, as shown in Fig. 1, and held firmly in place by the cross-truss rods. This leaves the side-sills at the bolsters nearly solid, and prevents the ends of the car-body from sagging, as is frequently the case.

This truck is in use on many roads, some with and some without safety-beams. When constructed as indicated in the drawings, we are told that shop-hands who do the repairing give it a first-rate character.

THE Railroad Commissioner of Michigan, after pointing out the difficulties in the way of framing any general law discriminating in rates of freight between competing and non-competing points that would be just and equitable in its application to all roads, suggests that a tariff regulation to meet these requisites could only be such a one as would apply to each road separately, by fixing rates from station to station; and that even this would be productive of great injury to the material interests of the State. He therefore asks to be relieved from the responsibility of fixing rates of fare. He also refers to the small number of persons killed or injured by train collisions, as compared with the number of casualties from similar causes in Massachusetts, in 1872, and attributes it to the general use of air-brakes and Miller platforms on the Michigan roads, the former having been introduced upon all the roads in the State but four. Two of these, however, are now being supplied with it; the other two run mixed trains to which the brake can not be applied.

Communications.

The Standard Axle.

To the Editor of The National Car-Builder:

Dear Sir: In an editorial paragraph of your last issue, you designate certain points in favor of the so-called standard axle as having been pretty clearly demonstrated. Would my time and your space permit, I would like to examine all of these points in detail, but must at present be content to take up two of them—strength and friction—believing that these include about all the others. As regards the first, I am not disposed to deny that an axle containing a given weight of iron is stronger than one weighing 100 pounds less, all other things being equal. This hardly requires demonstration. But mere strength when improperly used may become a very dangerous thing, as was illustrated by Samson of old, and may be employed for our own self-destruction or that of our own work, just as our friends, the advocates of the standard axle have done, by showing its enormous carrying capacity. Let us look for a moment at its record.

Mr. Childs said, at the Boston convention, that the Great Western Railway, which he represented, had some cars built for the special purpose of carrying 50 tons of square timber, and that they did carry this weight, and were furnished, moreover, with axles of the same dimensions as the would-be standard axle. Now, Mr. Editor, I suppose this gentleman was altogether unaware that he was saying the burial service over this axle, so far as it is adapted to ordinary box cars; for while he shows its capacity for carrying 50 tons of timber, he directly raises a question in regard to the sanity of those who would use it to carry 10 or 15 tons of merchandise or other freight.

A word now in regard to the claim of diminished friction. In your issue of last November, Prof. John E. Sweet is represented as saying in the course of a long article on the subject of friction, "Let us take, for example, a wheel one foot in diameter, mounted upon a shaft one inch in diameter: if a string be passed over the outside of the wheel and a weight attached to its end, it will require a given weight to turn it; now if a shaft of the same weight, but of twice the diameter, be substituted for the inch-shaft, it will require just twice the weight to turn it, because in the first case we have twice the leverage we do in the other; so no matter whether the resistance is friction or weight, the difference is wholly accounted for by the difference in leverage." You will see, Mr. Editor, that this is substantially what I claimed in my article published in your June number, the phraseology making the increase of friction depend on the increase of surface, when I should have said that an increase of diameter diminished the leverage, and thereby increased the frictional resistance. Take another illustration: Suppose a man to be turning a grindstone, and that another man should apply a pressure to the circumference of the stone just sufficient to overcome the strength of the man who is turning it; but let the same pressure be applied upon a circumference one half or one third the distance from the centre or axle, and the same power applied to the crank will turn it quite easily, the difference being altogether one of leverage. Prof. Sweet also suggests the use of long small bearings if we would have the least friction, providing they are not so small as to spring or bend equal to the thickness of a film of oil, in which case the limit is passed.

I think your correspondent "Inquirer," in your last number, has the right idea of an axle; and the size he mentions, except a $\frac{1}{4}$ inch in length, is the same as the coach-axle used on the Lake Shore and Michigan Southern road under the heaviest cars; and my impression is, that this axle with as small a projection as possible outside of the wheel, is the ideal axle for freight, and that the one recommended by the committee a year ago ($3\frac{1}{2}$ x 7), is the proper size for coaches, no question being raised by opponents, even, in regard to strength. G. G.

Buffalo, March, 1874.

Comment by the Editor.—There can be no doubt as to the correctness of our correspondent's views in regard to the retarding effect, or tax upon the power, caused by diminished leverage, and that such diminution necessarily results from increased journal diameter. Leverage and friction, however, are separate elements, and it is essential not to lose sight of the distinction between them. If we debit the $3\frac{3}{4}$ journal with whatever disadvantage is due to loss of leverage, we must, in order to adjust the account and strike a balance, credit it with whatever benefit is derived from a larger wearing surface and better and more economical lubrication. We are not prepared to say whether this more than compensates for what is lost in leverage, but we are inclined to think that it is at least a full equivalent for such loss. This would seem to be confirmed by some statements made by Mr. Garey at the last car-builders' monthly meeting, and which the reader will find in another column. Our correspondent omits to state that the 50-ton cars referred to by Mr. Childs, had 8 axles and 16 journals each.

To the Editor of The National Car-Builder:

Dear Sir: I have read with much interest the articles contained in your valuable journal in reference to the standard axle; but being a mechanic and not a writer for the press, I have refrained thus far from taking any part in the discussion of its merits. But inasmuch as the discussion is kept up, I take the liberty of making a few suggestions upon one or two points to which allusion was made in your comments upon "Inquirer's" communication in your last issue. I have never approved of the present dimensions of the standard axle, believing as I do that a smaller axle and journal would be just as safe, and do the work required just as well and with as little or less expense, aside from the first cost and the additional dead-weight carried. Many of the members of the Car-Builders' Association in attendance at the Boston Convention, appeared to be impressed with the idea that it was hardly possible to get an axle too large; and as those who entertained opposite views were, as a rule, rather indifferent speakers, it has occurred to me that, if these views had been supported by the requisite oratorical ability, the result might have been different. But as I believe in the rule of the majority, I accept the situation. I do not propose to make any change in the length or diameter of the journal, which it seems to me are properly proportioned; but I do desire to ask practical car-builders why it is necessary for the outside collar and space between the journal and wheel to be an inch larger in diameter than the journal? I have always considered $\frac{3}{4}$ sufficient with a 3-inch journal; and the axles I am now making for the road with which I am connected, have a difference of only $\frac{1}{2}$ an inch. Now if $\frac{3}{4}$ of an inch difference between a 3-inch journal and the diameter of the collar and space next to the wheel, is sufficient, I see no reason why it is not sufficient for a larger journal, as it certainly has more wearing surface.

In regard to the wheel-fit, the largest diameter in use before the introduction of the standard axle, was $4\frac{1}{2}$ inches, and I may safely say that 95 per cent of the axles now in use are smaller even than this. I think no breakages inside the wheel have been reported since the abrupt shoulder has been abandoned. So I can see no reason why a wheel-fit of $4\frac{5}{8}$ is not large enough for any emergency; and also a diameter of $3\frac{3}{4}$ for the middle of the axle, instead of 4 inches. Indeed, it seems to me that, with the exception of the journals, the diameter of the entire axle might be reduced $\frac{1}{4}$ of an inch without marring its proportions or diminishing its safety, and saving about 40 pounds in weight. The finished standard axle is reported to weigh 342 pounds. I have just got four forged for trial, and find they weigh 382 pounds in the rough, or 112 pounds more than the axles we are now using—and we have no broken ones. If, as you suggest, Mr. Editor, the weight of the standard axle can be reduced 40 or 50 pounds without any detriment to its capacity, I think it should be done, and it would then be more satisfactory to all concerned. My purpose in sending you this communication is to call the attention of car-builders to the fact that the alteration can be made without interfering with the journal or the length of the axle. Car-Builder.

To the Editor of the National Car-Builder:

Dear Sir: I read with much interest the communication of "Inquirer" in your last number, and was pleased with the kind and tolerant manner in which the writer alludes to the differences of opinion and judgment among the members of the Master Car-Builders' Association. I desire to reply in the same spirit; and while I am compelled to differ with him very much in regard to some of his views, I fully concur with him in respect to others, so far at least as he is an advocate of improvements in car-building; for in my judgment the business is yet comparatively in its infancy, and many radical changes will doubtless be introduced within the next ten years. The writer alluded to the meeting of car-builders at Adrian in 1866 as the first regular meeting of the kind in the country. This is a mistake, as to its being the first. There had been some four or more meetings held previously, and out of which our national association has grown. The meeting at Adrian was an assemblage of car-builders, including myself, connected with roads over which the Red Line cars were run.

"Inquirer" renews the discussion of the merits of the standard axle, and with the utmost respect for the opinion of those who voted for its adoption, thinks the journal unnecessarily large, and that experience has shown that $3\frac{1}{4}$ inch journals will carry 15 tons with entire safety. Now my own experience, not as large as his perhaps, leads me to a somewhat different conclusion. I do not propose to show the fallacy of the "child's head and man's body" illustration of your Buffalo correspondent, but I would ask "Inquirer" if he has ever made a comparative practical test of the $3\frac{3}{4}$ x 7 and the $3\frac{1}{4}$ x $5\frac{1}{2}$ journals? It is admitted that the latter have done good service, but it does not by any means follow that the same service would not have been performed with much greater economy if the journals had been larger, and the wear of brasses reduced one half as shown by the tests made by Mr. Garey. This alone is no small item. Take the New-York Central road for example, which has, say 10,000 cars, and 80,000 brasses worth about $1.75 each, amounting to $140,000. If they are renewed once a year, it involves an expenditure of this sum annually; but if they wear out only half as fast upon $3\frac{3}{4}$ x 7 journals, they would last as long again and thus save half this sum, or $70,000 every year, which is quite a nice little reduction in the item of brass alone. The same proportionate saving is also made in oil, or nearly so; and in the face of this it is urged by some that the large journals draw harder, and the cost would of course be increased. Rather a singular conclusion, this; for if the brasses wear less, and less oil is required, there must be less friction, and of course less power expended.

The mere opinion, even of railway mechanics of great experience, goes but a little way towards settling questions of this kind, unless sustained by practical results. Now I am well aware that there is a strong opposition among men of large experience in railroading to the introduction of the large axle; but I sincerely trust that no one will form conclusions with undue haste, for all history attests, almost without an exception, that whenever reforms have been introduced or innovations proposed in the moral, political, scientific, or mechanical spheres of human activity, they have at first been decried as fanatical and visionary. Bearing this in mind, let us give the stan-

dard axle a fair test, and if it can be shown to an absolute certainty that it is safe, that it saves brass and oil, taxes the motive power no more at least if not actually less, and on the whole economizes expenditure in the long run if not so perceptibly at first, it will eventually be adopted as a standard by all roads in spite of any mere opinions not sustained by facts. So far as it has been tested, the results show beyond a doubt that as a matter of economy no road can afford to delay the use of it. AXLE.

Railroad Police Regulation.

A BILL has been passed by the Legislature of Illinois, prescribing a variety of police regulations for railroads with the view of securing greater security to persons and property, and more prompt transportation. Its leading provisions are, as might be expected, crude and more or less impracticable, betraying on the part of its framers a very limited acquaintance with the details of railroad operation, as well as a disposition to make unjust and one-sided discriminations. Among other features of the bill is one requiring railroad companies to always have on hand the necessary quantity of rolling-stock to transport all the freight offered, and in case of failure to do so, to be liable for treble the amount of damage sustained by shippers. Considering the fluctuation of markets and other contingencies, which produce from time to time an unusual rush of business which ordinary foresight can not anticipate, such a provision is simply outrageous, and betrays very clearly the animus which dictated it. As well might the hay-seed Solons be required to anticipate weevils or caterpillars, a dry or wet season, in putting in their crops, and be held liable for not making a proper discrimination.

Another provision restricts the power of conductors to remove obnoxious passengers from trains, to such a degree as virtually to subject decent and orderly passengers to whatever annoyance a vulgar and drunken rowdy may choose to inflict upon them. The same rowdy may be kicked out of a groggery for like conduct, with a legal claim for damages only on the kickor; but under this law he may recover both against the company and also the conductor. This kind of law-making, however, practically defeats itself, as it exposes the mass of railroad travelers to insult just to the extent that immunity and protection are extended to roughs.

Another provision requires the use of automatic couplings, which is very well so far as they can be used; but so long as there is no uniformity in the construction of freight-cars as respects the height of drawbars, and as the cars of one road are constantly running upon other roads, the folly of such a requirement is obvious. No mixed freight-trains could be made up unless roads in other States used the same coupling.

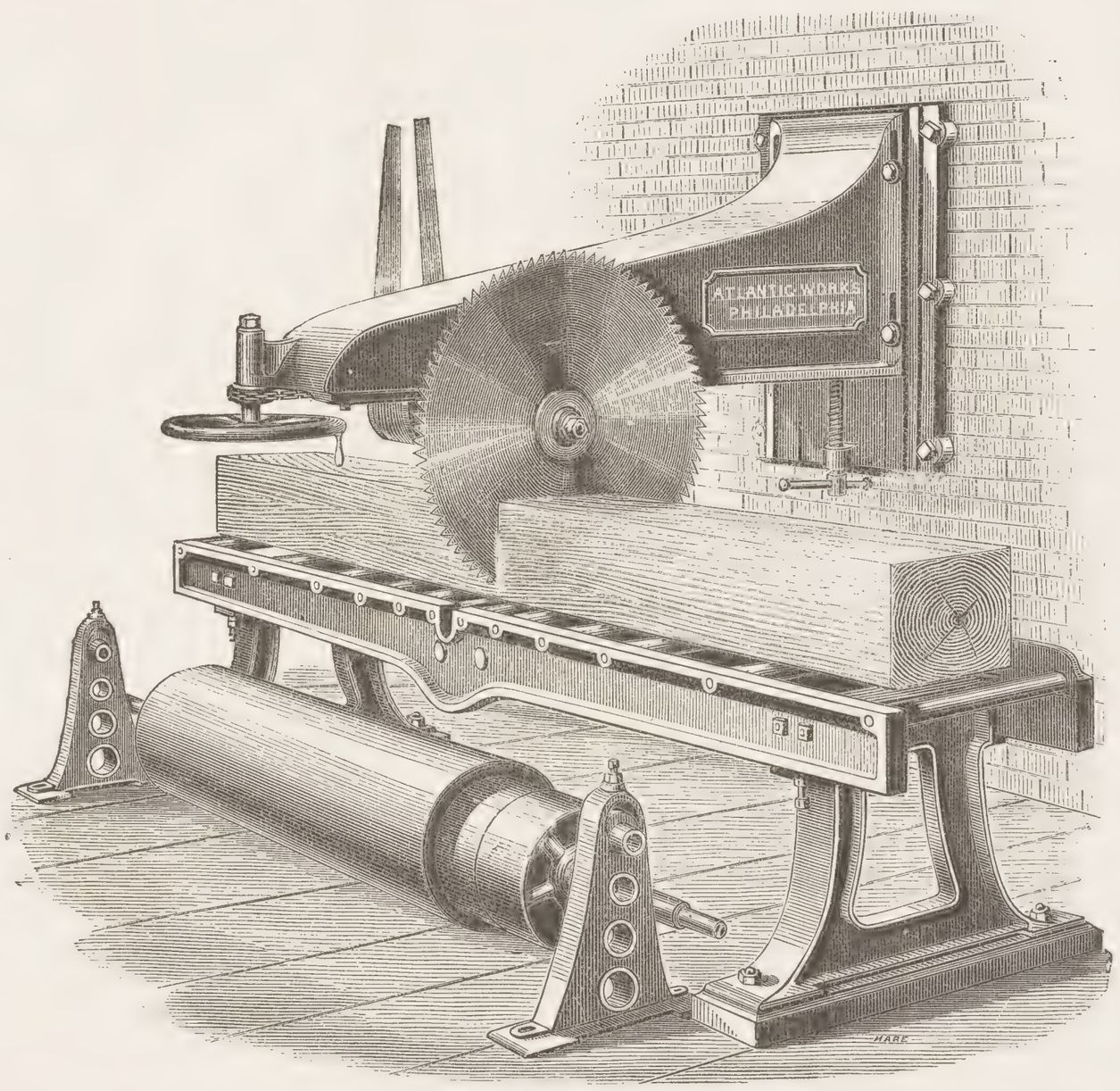
The bill imposes penalties upon conductors and engineers for many offenses, and also upon the companies for the same, thus making such penalties double, in disregard of the principle that the violation of a criminal statute implies an exercise of the will; for it is difficult to see why a corporation should be punished for a wilfully criminal act of its employees, especially when such act is in violation of its express rules.

THE Danforth Locomotive Works at Paterson have about 400 men at work and have commenced to run full time. They are working on an order for the Baltimore and Ohio Railroad.

Cross-Cutting Machine for Large Pieces.

FOR the cutting of light lumber, the saw-spindle can be mounted on fixed bearings and the lumber moved on a carriage; but when long or heavy pieces are to be cut, the saw must be moved to and through the pieces, in accordance with the principle that when two things are to be moved relatively, we are to move the one that can be moved most easily. When the lineal movement of long or heavy pieces is provided for by means of carriages or rollers, and the saws so arranged as to traverse across the line, cross-cutting becomes a cheap and easy process, requiring but little labor and less skill.

The engraving represents a cross-cutting machine made by Richards, London & Kelley, of Philadelphia, which is simple in its construction and exceedingly well adapted to the purpose intended. The saw is attached to a projecting frame which can be bolted to a wall or stout post, and adjusted to a higher or lower elevation by means of a screw underneath, as shown.



CROSS-CUTTING MACHINE.

The saw-spindle is mounted on an iron carriage which is moved easily along the projecting frame, by the hand-wheel seen in front. The belt which drives the saw passes over a long drum placed overhead, its axis being at a right-angle with the saw-spindle, so that in moving the saw, the belt traverses with a uniform tension along the drum. The form of the drum and hangers is shown detached in the drawing in front of the machine.

The carriage for the lumber is made wholly of iron, and is extra strong, and a series of wrought-iron rollers are provided to facilitate the movement. The machine uses saws 44 inches in diameter, maximum size, and cuts pieces as large as 18 inches square. We are informed that many of them are already in use in carshops and elsewhere, and give uniform satisfaction.

IT is hardly possible to introduce successfully an improvement in machinery of any class without the aid of a good engraving. It not only serves to show at a glance the valuable features of the machine, more effectually than the longest verbal description can do, but it also constitutes the very best method of advertising an invention, its attractive appearance securing the attention of the reader, while a column of reading matter, without illustration, might be overlooked.

A Private Palace-Car.

MESSRS. BOWERS, DURE & Co., of the Wilmington, Del., Car-Works, have recently turned out a very superior specimen of workmanship in the shape of a palace-car designed for the private use of Col. Henry S. McComb, President of the Southern Railroad Association. It is 65 feet long, including platforms, or 60 feet long by 9 feet wide, inside measurement, runs upon six-wheel trucks, and is equipped with Miller platforms and the Westinghouse air-brake apparatus. The principal compartments are a drawing-room 17 x 9 feet, a dining-room 12 x 9, two sleeping-rooms, each 8 x 7, and a kitchen 9 x 7. The drawing-room occupies the rear end of the car, next to which are the sleeping apartments, separated by folding-door partitions and flanked by a side-passage; next is the dining-room, and next the kitchen, occupying the forward end of the car. The interior finish is in solid black-walnut with raised panels of French walnut burl. The furniture of the several compartments is exceedingly rich, tasteful, and appropriate. The floors are covered with tapestry carpets, and French mirrors are a conspicuous feature of the fitting up. Three solid bronze lamps hang from the ceiling of the drawing-room and directly over a handsome centre-table, which is surrounded by spring-bottom sofas and chairs upholstered in green rep. The windows have green satin curtains trimmed with canary silk. The dining-room extension-table can be contracted from 9 feet to 22 inches. On each side of this room are spring sofas, which can be turned into double beds. It is lighted with lamps similar to those in the drawing-room. The sleeping-rooms are replete with every convenience to be found in first-class hotels, including water-closet and toilet for each, and two bunks with Cobbs' patent elliptic spring bed-bottoms. The windows are hung with lambrequin lined with buff, and silk-striped Terry curtains are used in other places. Call-bells are in easy reach. The car is supplied with water from tanks over the kitchen, and is warmed by a Baker heater. The trucks have adjustable axles adapted to gauges varying from 4 feet 8½ inches to five feet.

The car in its design, construction, and details of finishing and fitting up, is considered a masterpiece of workmanship highly creditable to the skill and taste of the builders. There is nothing about it suggestive of mere display, but, on the contrary, utility and ornament are so combined as to be necessary counterparts of each other. The exterior is not at all showy, and bears no inscription except "New-Orleans, St. Louis, and Chicago Railroad, No. 43." The car left Wilmington about a month ago for New-Orleans, by way of Philadelphia, Pittsburg, and the West.

THE twenty-seventh annual report of the Pennsylvania Railroad Company has just been published. The net earnings of the main line from Philadelphia to Pittsburg for 1873 are $9,445,703.74, being an increase of $1,197,851.56 over those of the previous year. Of these earnings there is a surplus left of $2,198,767.14 after paying dividends, taxes, interest on bonds, etc., an amount largely exceeding any deficiency from operating leased lines. The earnings of 511 miles of branch lines, excepting the Philadelphia and Erie, show a net profit, after deducting rents and operating expenses, of $17,430.12. The New-Jersey branches and canals show a net loss of $685,689.70, caused by inadequate facilities for handling freight, which will be remedied this year. The increased revenue derived from general freights over that of 1872, is $2,751,663.66.

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JAMES GILLET, EDITOR.
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APRIL, 1874.

Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Railroad Statistics.

WE often receive letters asking for statistical information in regard to sundry important matters pertaining to railway operation, which information we are quite unable to furnish owing to the lack of requisite data. One correspondent, for instance, wishes to know how many persons are killed annually in the United States while coupling freight-cars, or by falling between them, and what ratio these fatalities bear to the whole number of deaths from other causes connected with the running and management of railway trains. Another inquires respecting the average mileage capacity of a particular kind of car, the average expenditure for repairs during the life of such car, or the comparative durability of some special feature of a truck or car-body. These, and other inquiries of a like nature, are often made by persons officially connected with railroads, and who are evidently under the impression that our facilities for obtaining information of this kind are such as to enable us to give a prompt and satisfactory reply. This, however, is very far from being the case. We are often very much in need of such information ourselves, and would gladly furnish it if we could to railway officials and others; but before we can do so the roads must first furnish it to us, or put it in such form as to make it accessible to the public.

The mass of railway statistics to be found in manuals and elsewhere are exceedingly valuable so far as they go, and so far as they are accurate and reliable; but our railway system will, we think, be more worthy of the name when it shall have become subject to such uniform regulation as will impose an obligation upon every company to make at stated periods a full exhibit, not only of its financial condition, but of all other matters which affect the economy of road operation. This, it is obvious, would be mutually advantageous to railway interests and to the general public. At present there is no such regulation binding upon all the roads in the country, and consequently there exist no comprehensive and reliable data for compiling general statistics, including the items above referred to and others which might be named. Such data, it seems to us, can only be obtained from annual reports made in obedience to State authority and in accordance with prescribed details. It is useless to expect that roads in different parts of the country, within the jurisdiction of different States, subject to various kinds of management, doing a prosperous business or struggling under financial embarrassment, will voluntarily make reports in conformity with such special requirements as will suit the compilers of manuals or the mere statistician. So long as the great majority of roads are under no legal obligation to make annual reports, or if they are under such obligation, can make them either full and explicit or meagre and confused, as best suits their views of expediency, it is idle to talk of more complete or reliable statistics than we now have. Nor do we think that any improvement can be brought about by legislation which is avowedly hostile to railway interests; but rather by such enactments as will manifestly promote such interests by placing all roads upon an equal footing and making them sharers in a common benefit. Why should not every railroad company in every State furnish reports for every calendar or fiscal year as complete and reliable as those made to the Massachusetts or Ohio commissioners? and why should there not be a uniform system of keeping railroad accounts, and also a uniform fiscal year?

In one respect the official reports are at present notoriously defective, and that is in relation to accidents of all classes. If these are mentioned at all, it is usually in such a brief and general way as to be of little service to the compiler in analyzing and classifying causes, and thus furnishing data to indicate the best means of rendering such occurrences less frequent. It seems to us that a very great advantage would accrue to railroads if they were compelled by law to make a careful record of all accidents on their several lines, embracing a clear statement of the causes, the number killed or injured, and all essential particulars, this record to be made a part of their annual reports, to be afterwards tabulated or consolidated in such form as to be accessible to the public. Such an exhibit, assuming it to be complete and trustworthy, would be extremely valuable to railroad mechanics, operators, and managers, by indicating defects to be cured and mistakes to be avoided; and any one at all curious to know the magnitude of the car-coupling death-roll, could with little trouble have his curiosity gratified.

There are also other omissions in the current railway reports which lessen the value of our general statistics, and these may be designated as pertaining to the classes and quality of rolling-stock, the comparative advantages and durability of different methods of construction, wear of material, etc., the importance of which is understood by every car-builder and master-mechanic.

Western Railroad Regulation.

THE Legislatures of the North-western States are busily engaged just now in the regulation of railroads. Other local matters are of secondary importance compared with the all-absorbing topics of fares and rates of transportation. How long this mania is likely to last it is not easy to predict. Like other periodical excitements, it will have its day; but unlike many others, it is sure to engender while it continues an amount of ill-feeling highly detrimental to the best interests of all concerned. Railroads are as essential to the future well-being of the North-west as they have been instrumental in bringing about its present development, sustaining as they do the same relation to its productive industry that blood-circulation does to animal vitality. The productiveness of its soil and the multiplied facilities for local transportation have given to agriculture an undue prominence. Other industries have been comparatively neglected, and the result is a glut of cereal and other products which can not be profitably transported to distant markets. Cheaper freights can no more remedy this state of things than an excessive issue of irredeemable paper dollars can add to the national wealth. A temporary relief may be experienced, but the unnatural stimulant is sure to leave the patient more prostrated than ever. The true remedy does not lie in that direction, but in a more diversified industry. The problem will never be solved satisfactorily by an indiscriminate crusade against railroads, and this ought to be apparent, it would seem, even to the average legislative intellect. The material of which local legislatures are composed is not always judiciously selected, the majority as a rule being small-calibered politicians, thrown to the surface in the turmoil of an electioneering canvas and wholly unfitted by education or business experience for acquitting themselves creditably as law-makers. These Western legislators are, we imagine, no exception to the rule. They have at their backs a clamorous "hay-seed" constituency threatening their political heads with decapitation if they do not toe the mark on the railroad question. They must join the popular chorus and prove themselves true reformers by branding all railroad corporations as soulless extortionists, monopolists, and cheats—a disturbing element in the bucolic community, to be legislated out of existence if they are unable to transport hay to Liverpool at a rate that will leave a profit to the Minnesota shipper. The laws of demand and supply are nothing, facts and statistics are nothing, the rule of three and the multiplication-table are nothing; and so the regulation furore goes on, and will go on until the inexorable logic of events reveals the fact that the great business interests of large communities are mutually dependent, and that the owners of railroad property can not be deprived of a reasonable discretion in its management without inflicting injury upon all other interests to a corresponding extent.

One little incident to which we will refer, serves to show the drift of anti-railroad legislation of the Illinois stripe. The Chicago, Burlington, and Quincy Railroad Company, not being able to run one freight and one passenger train daily on the Galva and Keithsburg Branch, as it has been doing heretofore, owing to the restriction of fares under the new law to three cents per mile, discontinued the regular passenger train, and added one or two passenger-cars to the freight train. This of course did not suit the people along the line; meetings were held and offers made to pay such fares as were necessary to meet expenses if the company would again put on the passenger train. But these offers the company could not accept, as they were legally restricted to the above-named rate, which did *not* pay expenses, the general superintendent, Mr. Robert Harris, in his reply to the request of the petitioners, remarking somewhat pungently, that "as business men they were obliged to recognize the laws of commerce as well as the laws of the Legislature, and that the law in question, like all other unjust laws, was detrimental to others as well as to the particular interest it was designed to oppress." This is what may be termed a practical "eye-opener," so far at least as the patrons of the branch line are concerned.

Annual Meetings.

THE Seventh Annual Convention of the Master Mechanics' Association will meet in Chicago, Tuesday, May 12th.

The sixth Annual Convention of the American Society of Civil Engineers will meet in New-York, Wednesday, June 10th.

The Eighth Annual Convention of the Master Car-Builders' Association will be held in Cincinnati, Wednesday, June 10th.

Car-Builders' Monthly Meeting.

THE regular monthly meeting for social and business purposes, was held on Thursday evening, March 19th. There were present, L. Garey, J. T. Leighton, George Hackett, C. A. Smith, M. C. Andrews, Ellis Dodge, D. H. Baker, B. N. Phelps, M. N. Forney, D. Hoit, and others.

In the absence of the President of the Association, the meeting was called to order by Mr. Garey, the Secretary, who stated that the subjects for discussion were Centre-Plates, Side-Bearings, and Journal-Bearings. Before proceeding to consider these subjects, however,

Mr. J. C. Wands, of New-York, who was present, was invited to explain the merits of a new style of roof for freight-cars, the material consisting of corrugated zinc put on in a peculiar manner, so as to accommodate itself to the oscillating and vibratory motions of the car, while it is at the same time held securely in its place. Its application was shown by a model, but can not be very clearly described without the aid of drawings. This kind of roof is claimed to be lighter, cheaper, and more durable than those ordinarily used, and has been already introduced on a number of roads in the South-west. We are promised some cuts which will enable us to give a more particular description of it hereafter.

Mr. Frederick R. Mundy, of New-York, exhibited a car journal-box with a friction-roller, designed to work in contact with the journal, and resting upon it in place of the ordinary bearing. The roller is 6 inches in diameter, and revolves upon a fixed steel axis or spindle 1½ inches in diameter, fastened to the front and back walls of the box. The journal being a little more than half the diameter of the roller, makes nearly two revolutions to one of the latter. The latter revolving on the small steel spindle, with perfect lubrication, the ordinary journal friction is transferred to this point, and in consequence of the comparatively slow movement of the surfaces, the usual friction is diminished, and less power required to move the car. We are promised an illustration of the box for our next number, when it will be more fully described.

A good deal of discussion ensued in regard to the advantages of such an arrangement, some maintaining that similar devices had already been tried; and that whatever might be gained in diminished friction would be neutralized or lost by the small bearing surface of the spindle, and consequent imperfect lubrication. Small journals were found to force out the oil and destroy its lubricating properties, and for this reason car-journals had been increasing in size for the last thirty years. To this it was replied that previous experiments which had failed, were made with roller and spindle solid, while in this case the roller took a bearing the length of the spindle; and with respect to the lubrication, the oil was so confined to the surfaces that it could not escape. The comparative advantages of large and small journals were incidentally discussed, in the course of which,

Mr. Garey described the following experimental tests which he had made of the power required to move cars with different-sized journals: A passenger-car with 3¼-inch journals and weighing 44,674 pounds, required a force of 800 pounds, as shown by a dynamometer, to move it along a level track as slowly as the engine could be made to move. The car was in good running condition and the journals well fitted. Another passenger-car, which was new and had run only 90 miles, weighing 46,770 pounds, and with 3¾-inch journals, required just 700 pounds, as indicated by the same instrument, to move it on the same track and in the same way as the other; thus showing that 100 pounds less force was required to move the heaviest car with the large journals.

Mr. G. R. Meneely, of West-Troy, N. Y., called the attention of the meeting to a style of car journal-bearing invented and patented by himself, and consisting of two kinds of metal welded together, the outer or non-wearing section being tough bronze or brass, and the inner or wearing part, of bronze of greater hardness, the two pieces being welded while in a state of fusion so as to be inseparable. He believed the wearing surface could not be too hard, if liability to fracture could be overcome. This objection did not apply to his bearings; they were at the same time less liable to heat, would last longer, and cost no more than the ordinary kind. The reader is referred to an illustration of them in our advertising columns.

A gentleman representing the firm of Hubbard & Ainsworth, of Jersey City, proprietors of "Ainsworth's Friction Metal," presented specimens of the same, one of which had run 40,363 miles under a Pullman car without heating. The metal is claimed to be 25 per cent cheaper than brass, three times as durable, and requiring 50 per cent less oil. It had received the highest premium at the last American Institute Fair, and was indorsed by a number of prominent manufacturers.

Mr. Garey remarked that in the course of his experience he had heard much of anti-friction metals, but had rarely or never seen any. He *did* remember making a trial of one specimen, which, it was claimed, would run without any oil at all, and not get hot. And it did do so for a considerable time, and then he had to throw it away. It was like the horse that undertook to live without eating; as soon as he got well under way, he died.

Mr. J. R. Baker, of the firm of Baker, Stiles & Co., of Jersey City, presented the claims of certain bearing metals manufactured by this firm, the qualities of which had been tested by railroads, steamers, and mills for several years past, and had proved entirely satisfactory as regards cheapness, durability, small consumption of oil, etc.

Mr. D. A. Hopkins called attention to the advantages of lead-lined bearings. They had been tried under heavy palace-cars, and had run 58,000 miles without heating or wearing out. The lead should not be more than $\frac{1}{16}$ of an inch in thickness; it then accommodates itself to the journal, and gives a true bearing; but if thicker, will be pressed out at the sides and ends.

After some farther conversation, and inspection of models and drawings, the meeting adjourned. The next meeting will be on the 16th of April. The same subjects for discussion are continued, namely, Journal-Bearings, Centre-Plates, and Side-Bearings.

Steel vs. Iron.

THE *American Manufacturer* says: One great objection to the more general employment of steel for purposes where much strain is to be endured, and where human life is to be risked, is, according to Mr. Robert Mallet, the lack of some reliable and ready means of testing the same. The very quality that chiefly reccommends steel is the one most difficult to-determine, and the most dangerous if absent. The strength of steel in plated structures as proportioned to iron, is usually rated something like 10 to 6.

One great source of imperfection in steel is the injuries which it is liable to sustain in the process of manufacture; when a bar or plate gets a hammer blow while hot, or any thing like a dent, or sustains any concussion which causes a sudden change of dimension, however minute, such bar or plate, in most cases, is certain to give way at the point of concussion on receiving a strain much less than would break the bar elsewhere. Any thing, also, in the nature of a superficial injury to a plate, is much more serious in its effects on steel than on iron.

Steel as adapted for rails is said to show greater difference of good and evil than it does under any other conditions for use. A commission of fifteen railway engineers recently reported that the weight of evidence was in favor of employing steel instead of iron for rails in railway use; but especial stress was laid upon the necessity that existed for the exercise of the most extreme care in the manufacture of the rails—specially in handling them while hot. Experience had shown that steel rails almost always break at the point where some injury had been received while the rail was hot. In most cases such rails break in a few weeks; while perfectly sound rails work without any perceptible wear or injury, for 12 or 15 years.

Steel is proved to be very much superior to iron when used for gearing; but it is proved that gearing mounted on timber framing is much more liable to fracture than when properly fitted on an iron frame. Wood, even when well secured, will warp and twist sufficient to disarrange delicate machinery.

Close attention is being paid to the use of steel as far as adopted, with the view of its more general adaptation, according to the greater or less extent of success which may attend its present employment.

Testing Steam Boilers.

THE report of the inspections made by the Hartford Steam Boiler Inspection and Insurance Company, for December, 1873, contains some very interesting facts and suggestions. Speaking of the tests usually applied to boilers, the author says:

"It must be borne in mind that there are all kinds and types of boilers in use in the country, and that the average ability of attendants is very low. Defects which point directly to disaster are met with almost daily, and we believe many explosions of boilers have been prevented by the thorough examination which has discovered such defects as those in the above report. A cursory examination or a simple test will do little toward bringing such defects to light. The work must be thorough, and time enough must be taken. No specific rule can be laid down for making these examinations. Each case requires treatment in accordance with the circumstances connected with it; that is, the type of boiler, pressure carried, character of bracing, quality of water, efficiency of attendant, etc., all of which have much to do with the question of preventing boiler explosions. Experiments on obsolete or special types of boilers will do little toward preventing the explosion of boilers in use, because the conditions under which boilers are used in manufactories are very different from those under which experimental boilers are used. Valuable information can be obtained on certain points by well-directed experiments. Tests of safety-valves is an important matter, and one that should receive special attention. It may, however, be a question whether the best way of making such tests would not be to subject them to actual use on boilers that were doing regular duty, day after day, for six months or a year. We believe in tests that are practical; and our experience goes to show that especially in a question of such vital importance as that which seeks for its solution the prevention of boiler explosions, too great care and too much time can not be taken. A great many worthless boiler appliances have been palmed off upon steam-users, the only proof of their efficiency being that they had worked well under some experimental test. But when subjected to the conditions of constant use, they have proved utterly worthless.

THE Ohio Falls Car Company announce that having made satisfactory arrangements with their creditors, they are now relieved from all financial embarrassment, and are prepared to execute with promptness orders for freight or passenger-cars, and also for car-wheels, either separate or fitted upon axles. The company have a large supply of thoroughly seasoned lumber, and their works are fitted up with the best and most approved machinery. They also have on hand and offer for sale, a number of passenger and centre-dumping coal-cars, specifications of which may be had on application.

THE Grant Locomotive Works at Paterson, N. J., now employ about 500 men. They are at work on an order for the Chicago and North-western, and have, it is stated, orders enough to keep the shops full for some time.

Analyses of Car-Axles.

To the Editor of the National Car-Builder:

Dear Sir: Some time since Mr. Garey, of the New-York Central and Hudson River Railroad, sent me several specimens of cuts taken in the lathe from axles of various terms of service. I made chemical and microscopical analyses of these with the following results:

Previous to my examination of these specimens, I accepted with others the generally received theories as to causes of weakness or breakage in iron under use. Some of these theories I am now satisfied are erroneous.

Specimens.	Iron	Phos.	Sulph.	Carbon	Silicon
Talcott Axle, 1860,	99.4	Trace	.025	.270	Trace
French's " 15 y'rs service,	99.51	00	.031	.213	"
C. & R. " 20 " "	99.1	Trace	.024	.230	"
Talcott, new, 1873,	99.3	00	.02	.35	"

The variation in the chemical constituents of these four analyses being certainly too small to be caused by use, and in order to still further satisfy myself, I made careful tests of each of four specimens of "C. & R." axle, run twenty years, resulting as follows:

	Iron	Phos.	Sulph.	Carbon	Silicon	Total
Inside shoulder of journal,	99.1	Trace	.024	.230	Trace	99.354
Centre of wheel-seat,	"	"	"	"	"	"
Inside of wheel-hub,	"	"	"	"	"	"
Centre of axle,	"	Strong	.103	"	"	"

The change in centre of axle is due, no doubt, to the introduction of a particularly "red short" piece of iron at that point in its manufacture.

As it would be somewhat difficult to convey in a wood-cut, or in fact any form of illustration, a clear idea of the appearance of the specimens under the microscope, I must be content with trying to describe it.

I prepared them by taking two pieces from each point of each axle as nearly as possible of one fourth of an inch cross-section. To obtain the horizontal fibre, I subjected these pieces to a uniform pressure of seven tons; the end views I made simply from the broken cross-sections at each point.

The specimens from new axles give uniform results at all points, the ordinary fibre of good iron strongly and uniformly interlaced, no point being marked in the structure as indicative of breaking; and while in all cases this distinctive character is to a great extent maintained in the centre of the axle, I find with each extension of the term of service, a stronger marked change in the structure of the iron in the centre of the journal and inside of wheel-hub. This approaches to crystallization of a marked form inside the hub in the oldest specimen.

The general appearance at these points is as though the gradual "travel" of each fibre upon its neighbors had worn them comparatively smooth, and though the specific gravity is the same, under 800 to 1200 diameters the cross-section displays marked lines of cleavage, and apparent disintegration of fibre.

I went into this examination with the impression that the so-called "crystallization" of axles, if it ever occurred, would be found most marked at a point equidistant from both journals. The results show that point to retain its most natural form. The average of all the specimens gives the centre of the journal as the next best point, while the inside of wheel-hub has the worst of all these effects most clearly marked. If, as is generally supposed, the hammering action is the cause of so-called crystallization, this point would be the last to feel its effects.

I am inclined to the impression now, that this "disintegration" of fibre is caused in a manner something as follows: The journals are heated by the friction incident to their work, causing expansion in every direction; the wheel being necessarily forced on at a great pressure, this expansion finds its vent only at the inside of the hub—unless it should split or crack the wheel—at which point I find this feature most marked. Upon inquiry since commencing this investigation, I find the majority of wheels start their breakages from this point upon the inside, while the greater number of axles are broken close to the wheel, this being the case especially with the small journals in use upon the Pennsylvania Railway.

I think that what is called crystallization of axles is caused, not by the hammering incident to railway travel, so much as to the frictional heating of journals, and the "molecular travel" of fibre caused thereby.

J. W. C.

Pittsburg, March 16th, 1874.

A Lady upon Car-Heating and Ventilation.

To the Editor of The National Car-Builder:

Dear Sir: I do not know whether you will admit to your columns a communication from a lady, nor how such a contribution will look among your machinery articles and mechanical problems; but having been so unfortunate as to be compelled to make a journey from St. Louis to Boston, and having got as far as Erie, Pa., I feel constrained to give you a little of my experience of the discomforts caused by imperfect car-heating and ventilation. The portion of my journey already accomplished was made during the cold weather we had early in the month; and on reaching here, I was so ill from being smothered and frozen, that I was glad to avail myself of the hospitality of friends in order to recuperate before proceeding further. For hours together, while in the cars, my feet would ache with the cold, while my head was ready to burst with the heat from two roasting hot stoves; and the foul air was fearful to endure.

While suffering these torments, somebody left on the seat near me the March number of The Car-Builder, in which I noticed an article on ventilation, describing a plan devised by Dr. Allen, of Philadelphia, in which it is said that the air could be changed in a car every three minutes, and the floor kept warm. Upon reading this, I resolved to write to you at once, and ask why our railroad managers do not have all cars fixed that way. The article said there was often in common cars a difference of 40° in the temperature between the floor and the heads of passengers. I think there must have been as much as 100° difference in the cars I rode in. Why, sir, I would rather ride in a car made of coarse boards if I could have warm feet and pure air, than in a gorgeously furnished palace-car, with freezing feet, aching head, and suffocating lungs. I hope, Mr. Editor, you will continue to discuss this subject until some improvement is made in the present methods of ventilating and heating; for railroad traveling in winter is now a fearful thing to endure.

C. E. W.

Erie, Pa., March 21, 1874.

A Tribute to Mr. Joseph Jones.

The following preamble and resolutions were adopted at a meeting of the employees of the car department of the West-Albany shops of the New-York Central and Hudson River Railroad, on the occasion of the retirement of Mr. Jones from the position of superintendent of the department. Mr. Jones has held this position during the past ten years, and has been in the employ of the company over thirty years. His future residence will be in Utica.

Whereas, Mr. Joseph Jones has lately resigned his position at the head of this department, which he has filled acceptably to the company and with credit to himself for a period of nearly ten years, besides being in the service of the Company in other departments for more than twenty-two years preceding; and

Whereas, we are unwilling that he should leave us without an expression of our sincere and warm regard for him as a superintendent, our appreciation of his sterling qualities as a man, and our earnest wishes for his future welfare; therefore

Resolved, That while on his account we should heartily rejoice at any change which may lead to his advancement or success in any sphere of usefulness which he may select, we can not but regret that the pleasant connection which has happily so long continued between us, is to be severed.

Resolved, That we shall always cherish the recollection of his unaffected kindness, his genial temper, and courteous manners, and although the same generous traits and sterling honesty of character can not fail to win for him many and firm friends in any sphere of life, we are sure that he will gain from none a more sincere respect or more hearty attachment than from those lately employed under him.

Resolved, That our prayer is, and ever shall be, that all best gifts may be conferred upon him; that it may be his lot in health and prosperity long to live, and that those who are nearest and dearest to him may be spared for many years to share with him a quiet and happy home.

Resolved, That a copy of these resolutions, appropriately engrossed, be presented to Mr. Jones.

Resolved, That they be published in the Albany papers.

La Fayette Case, John Gallon, George Schermerhorn, Jesse Jones, Alfred Harley, William Colby, Frederick Johnson, Jeff Thompson, Frederick Johnson, Committee.

Heating Railway-Cars.

A European railway engineer opposes the idea of heating each car separately, on account of the trouble of attending to the several appliances both during and after the journey. He also opposes any plan which merely warms the air, because of its bad hygienic effects and its failure to keep the feet warm. As there is but one mover of a train, so there should be but one heating, lighting, and braking apparatus. With regard to heating, he proposes to place as fixtures, heaters, or a coil of pipes, under the feet of passengers, and to cause a circulation in those of hot water. All the heaters of a train are united in themselves, they form a continuous circuit completed by connecting pipes between each carriage. The water is heated in a reservoir placed partly around the chimney of the locomotive, and partly in the smoke-box. The water is delivered from these through the train, and its circulation is accelerated by a pump with a velocity of about 0.5 metres per second. The reservoir placed round the chimney is encircled by a double envelope; the annular space between the reservoir and the outside envelope is in communication with the fire-box, and is therefore always filled with hot gases. To set it to work one must proceed thus: One of the injectors is modified so as to feed at pleasure the boiler or the hot-water apparatus. A half-hour before the departure of the train, a locomotive is attached, in which the water in the tender is already considerably heated. The injector is started to fill the reservoirs and heaters, and in a quarter of an hour all is ready. Experiments show that the heating surfaces of the reservoirs are amply sufficient to produce a constant supply of almost boiling water. Such an arrangement would be an immense boon for winter-traveling on any railway. No scrambles for hot-water pans, no fluctuations between hot and stone cold, and no selfish monopolization by the lucky one to the exclusion of others.

The Gardner-Ranson Brake.

The Car-Builder for May, 1873, contained a notice of the Gardner-Ranson power-brake invented by John W. Gardner and Thomas W. Ranson of Cleveland, Ohio. The brake is applied and released by means of compressed air, the action in either direction being instantaneous or gradual, as may be required. It is entirely under the control of the engineer. Its leading feature consists in its not being dependent upon springs or other mechanical means for releasing, this being accomplished by the reverse action of the same power by which the brake is applied.

A trial of it was recently made on the Concord (N. H.) Railroad, under the supervision of a number of railroad officials, with the following results. Stops made while running at a speed of 30 miles an hour—size of train not mentioned. One stop in 13 seconds, distance 336 feet; another in 10 seconds, and was moving back in 5 seconds; another in 15 seconds, and was moving back in 3 seconds; another in 11 seconds, and started ahead in 2 seconds. The last stop was made under a full head of 120 pounds of steam, in 17 seconds, and without shutting off. The

Concord road is the only one in New-England upon which the brake has been applied to an entire train, and the experiments were considered in all respects satisfactory. It has, we are informed, been tried with equal success upon a number of Western roads.

The Old Colony Railroad.

No railroad leading from Boston shows a better record of the past five years than the Old Colony. None have been managed with more regard to the public convenience and to the interest of the stock-holders. Since the entry of Gov. Stearns upon the presidency of this road, a new order of affairs has been initiated. This change showed itself in new depots, better rolling-stock, reduced fares, and stronger inducements to build and locate along the line of road, and to-day there are few roads in New-England better equipped and more judiciously managed than this. The growing confidence is seen in the increase of travel and freight, and the starting of new villages along the line of the road. Within the short period of eight years the travel upon this road has doubled, while its increase of freight has been nearly sixty per cent. More than one hundred new passenger coaches, many of them elegantly constructed, and some seven hundred freight cars, have been added to the rolling-stock. From twenty-nine locomotives the number has increased to sixty-three—mostly first class. Thus every facility is being afforded to meet the public wants and regain the popular favor.

The Cumming Nut-Lock.

THIS excellent device for preventing the loss of nuts in the working of machinery, and especially in the running of railway trains, appears to be steadily growing in favor. We are informed that the Philadelphia and Reading Railroad Company, after having tested its utility in an experimental way for a period of five and a half years, have purchased of the proprietors the right to use it upon all cars, bridges, machinery, etc., connected with their line. A description of the device will be found in our advertising pages.

THE Chicago and Pacific Railroad, upon which work was commenced in July, 1872, is now completed as far as Elgin, 35 miles from Chicago, and trains run regularly between these points. The line has been graded 50 miles farther, or two thirds the distance between Chicago and the Mississippi River, passing through one of the most elevated and highly productive portions of Illinois.

AN actor wishing to give an afternoon performance in Mobile, and another in the evening of the same day at New-Orleans, was conveyed by a special train from the latter to the former city in 3 hours and 6 minutes, the distance being 141 miles. Over favorable portions of the road, the speed was a mile a minute—so great, indeed, as to shatter the head-light of the locomotive.

A NEW method for ventilating smoking-cars was recently tested on the Boston and Albany Railroad. It consists principally of a boxed fan-wheel placed under the car, and operated by a pulley and belt attached to one of the axles, which forces the air through a pipe into the car, passing out at the top in nearly the usual manner.

THE last report of the Massachusetts Railroad Commissioners records 29 accidents during the year from car-coupling. The mileage of the roads in this State is 1735, and estimating these accidents in a similar ratio for the 70,857 miles of road in the whole country, would make an aggregate of 1183 accidents, which is doubtless very much below the actual number.

SPEAKING on the design and construction of modern locomotives, Mr. John Robinson, of Manchester, England, recently said that of late years the passenger traffic had so increased in the United Kingdom that even express trains were now worked, for the most part, with coupled engines, the additional points of contact with the rails being imperative, in order to prevent slipping, and to afford greater facility in starting. Increase in the size of engines had everywhere been found to be a necessity; and while the outside frames of inside cylinder engines had been generally abandoned, the inside cylinder arrangement had been almost universally adopted, notwithstanding the disadvantage it presented of a cranked driving-axle.

AMERICAN car-wheels have now become a permanent and reliable item in our domestic export trade. In the year 1871, the number exported was 2318; in 1872, it was 4760; and in 1873, it rose to 7515, despite the stagnation of the last four months. This is of much more importance to American industrial interests than the question whether our raw iron can be profitably exported to England.

MR. EDWARD VERNON, formerly General Ticket Agent of the St. Louis, Terre Haute, and Indianapolis Railroad, the founder and, until a year and a half ago, the editor of the *Travellers' Official Guide,* and also the founder and present editor of the *American Railroad Manual,* has been appointed Vice-President of the Arkansas Central Railway Company, with office in New-York.

A BILL has just passed the Iowa House of Representatives by a vote of 92 to 4, fixing the rates of railroad transportation. It arranges roads in three classes: on those of the first class, passenger-fare is to be 3 cents per mile; on the second class, 3½ cents; and on the third, 4 cents. In the populous East, these rates would not be considered cheap, but in Iowa the population is spread thinner.

A TESTIMONIAL, consisting of an address signed by a large number of merchants in New-Orleans and other places on the line, was presented to Gen. H. S. McComb, President of the New-Orleans, Jackson, and Great Northern and Mississippi Central companies, in New-Orleans, March 6th. The address is handsomely mounted and prepared, and sets forth the ability of Gen. McComb as a railroad manager, and the esteem in which he is held by those having dealings with his roads.

MR. DAVID HOIT, late Master Car-Builder of the Toledo, Wabash, and Western Railroad, at Toledo, Ohio, succeeds Mr. Joseph Jones as Superintendent of the New-York Central car-shops, at West-Albany. The long experience of Mr. Hoit at the West, and his acknowledged capacity as a manager of this special department, admirably qualify him for the duties of his new position.

Engineering describes a parlor and a sleeping-car of the Pullman pattern, which have been built for the Midland Railway. They are purposely made lighter than the ordinary American Pullman car, weighing 19 tons, with four-wheel trucks, and equipped with Westinghouse brakes, Miller platforms, and Baker heaters.

The Emery-Grinder, published by the Tanite Company, Stroudsburg, Pa., is a new four-page monthly journal, devoted, as its name imports, to the art of grinding, polishing, and shaping metals by the use of rotary tools composed of minerals in granular form. The publishers offer premiums of $50 for the best and $25 for the second best original essays on the subject of solid emery wheels, to be furnished before the 1st of July next.

Chicago and its Suburbs, by EVERETT CHAMBERLIN.—We are indebted to George S. Bowen, Superintendent of the Chicago and Pacific Railroad, for a copy of this publication. It is a well-printed and illustrated volume of 470 pages, containing a history of the origin and growth of the Western metropolis and its numerous suburbs, with elaborate railroad, manufacturing, and commercial statistics. As exhibiting the wonderful development of the city, it is a volume of public as well as local interest.

Facetiæ.

Two darkeys in the West went to hunt 'possums, and by accident found a large cave with a small entrance. Peeping in, they discovered three young bear-whelps in the interior. "Look heah, Sam, while I go in dar," said one, "and gets de young bars, you just watch heah for de ole bar." Sam got asleep in the sun, and when opening his eyes, he saw the old bear scouring her way into the cave. Quick as wink he caught her by the tail, when the darkey in the cave sung out like blazes, "Hullo, dar, what dark de hole dar?" "Lor bless you, Jumbo, save yourself, honey; if dis tail come out, you'll find what dark de hole."

A CAPTAIN, one of the old school, being at a ball, had been accepted by a beautiful partner, a lady of rank, who, in the most delicate manner possible, hinted to him the propriety of putting on a pair of gloves. "Oh!" was the elegant reply; "never mind me, ma'am; I shall wash my hands when I've done dancing."

AN *attaché* of a Georgia railroad was recently buried at the expense of his associates, who provided a new suit of clothes for the corpse. His wife, although on sorrow bent, had yet a frugal mind, and so she buried her husband in old clothes, and her brother added dignity to the funeral in the new suit of mourning. And the people who paid the bill were not satisfied.

A NEGRO in Boston complained at a police station that a brother colored man had broken a chair all to splinters over his head. On being told that there were no marks on his cranium, he said, "No! 'e didn't make no marks, but 'e smashed de ch'ar all ter pieces, and *de ch'ar belonged ter me.*"

"IF," advertised a philosophical victim, "the person who took a fancy to my overcoat was influenced by the weather, then all is serene; but if he did so from commercial considerations, I am ready to enter into financial negotiations for its return."

"WHEN the earthquake took place," said a husband to his wife, "I felt my heart beat so that I was frightened." "Yes," replied the dear creature, "it takes an earthquake to make your heart beat." And this couple have celebrated their silver wedding.

"MISTER CROW, what am your 'pinion of Sam Toby's character for honesty?" "Wal, as for Sam, I don't know nothing about him. Some says he's honest, and it may be so. I don't say he an't honest. But this I does say: if I war a chicken, and Sam was about the yard, dis niggah would *roost high,* he would."

AN Ohio woman, it is said, is at work upon a patent watch which will have hands so made and adjusted as to seize the wearer by the coat-collar every evening about ten o'clock, and walk him off home. Ten gross have been made.

AN indignant matron winds up a philippic against sleeping-cars with the clinching accusation that the system forces young girls to become "familiarized with that unattractive object, a sleepy and unwashed man."

SOME things that a man can't do: make a round triangle; lift himself off the ground by his boot-straps; make pork out of pig-iron; jump across a ditch at two jumps, and crawl down his own throat.

JONES complained of a bad smell inside the post-office, and asked Brown what it could be? Brown did not know, but suggested that it might be caused by the dead letters.

THE Danbury *News* says: There was a fight between Danbury and Norwalk roosters in this place on Friday. The pain every good citizen must feel over such a brutal display is somewhat mollified by the fact that our rooster licked.

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

MANUFACTURED BY

JOHN JEWETT & SONS,

182 Front Street, New-York.

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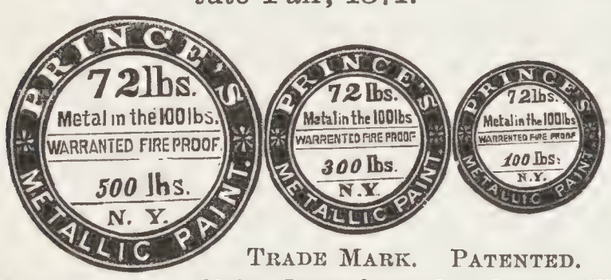

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An Indestructible Coating for Iron, Tin, and Wood.

PRINCE'S METALLIC PAINT

Is acknowledged, wherever known, to be the

BEST AND CHEAPEST PAINT IN THE MARKET.

WASON MANUFACTURING COMPANY,
RAILWAY CARS, CAR WHEELS, AND RAILWAY CASTINGS,
SPRINGFIELD, MASS., October 4, 1871.

GENTS: We have used Prince's Metallic Paint exclusively for several years. If we did not believe it to be the best we would not use it. Yours truly, GEORGE C. FISK, Pres't.

CHICAGO, BURLINGTON AND QUINCY RAILROAD,
AURORA, ILL., March 5, 1873.

GENTS: We have used your Metallic Paint about 12 years, more especially on locomotive work, and before adopting it, put it to the most severe tests of extreme heat and strong brine, at the same time testing comparatively, lead (white and red) and other Metallic Paints, and in these tests the "Prince's" came out ahead. I am satisfied that for engine and other iron work it is superior to any paint in use. Our paint-shop was painted two coats with it and boiled oil in February, 1863, and the paint is in good condition at this date, not having been painted since 1863. Respectfully, D. C. COOLEY.

For Sale, Dry and in Oil, by the Trade, and by

PRINCE'S METALLIC PAINT CO.,

MANUFACTURERS,

96 Cedar Street, New-York.

☞ All packages are marked with name and trade-mark.

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JOHN JEWETT & SONS PERFECTLY PURE WHITE LEAD TRADE MARK

This is the **ONLY QUALITY** of White Lead that we have made for the last 15 years.

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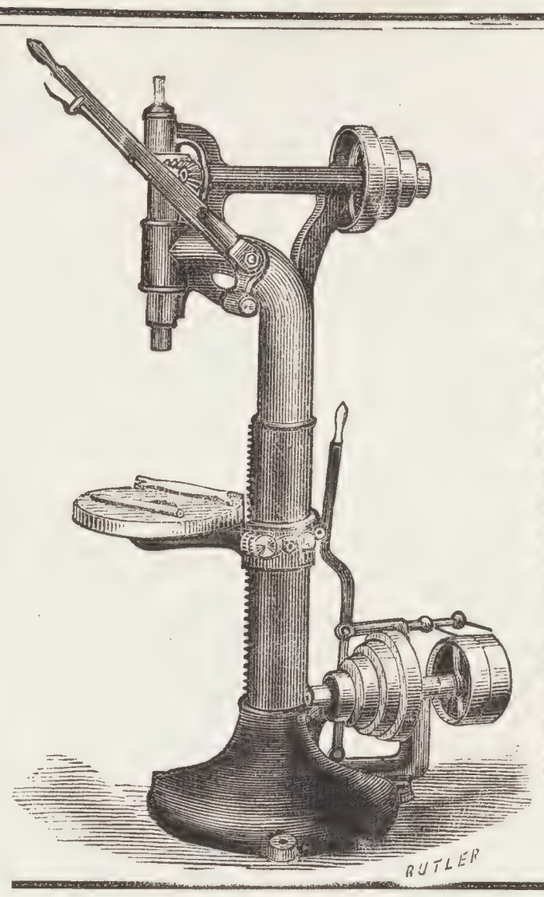
182 Front Street, New-York.



EDWIN HARRINGTON & SON,

Manufacturer of **ENGINE LATHES**, from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

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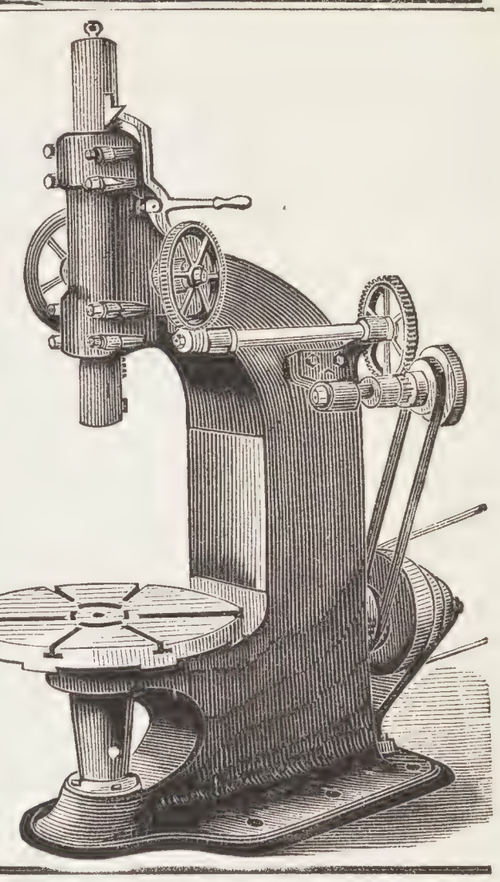
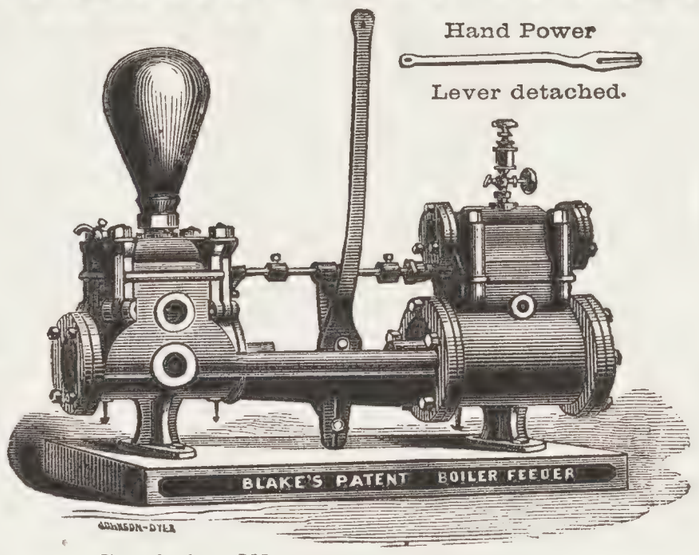


BLAKE'S PATENT STEAM PUMPS.



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THE

Geo. F. Blake Manf'g Co.,

79 and 81 Liberty St., New-York.

IMPORTANT TO RAILROAD COMPANIES.

TRADE ELASTIC H.S.A WASTE. MARK

DEVLAN'S PATENT ELASTIC WASTE,

It being composed of Incombustible and Lubricating Materials, "Hot Journals" are impossible where the Waste is properly used.

Certificates from Railroad Officials, showing its very decided advantages, are herewith annexed—namely:

PENNSYLVANIA RAILROAD—NEW-YORK DIVISION, JERSEY CITY, July 11, 1873.

GEO. W. BARKER, ESQ., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872, I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your request herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

OFFICE, ELASTIC WASTE COMPANY, No. 60 BROADWAY, NEW-YORK.

E. D. ALBRO,

507 to 515 West Sixth St., Cincinnati, Ohio.

Manufacturer and Dealer in all kinds of

VENEERS

Suitable for Car Builders' Use.

Also calls attention to his stock of

MAHOGANY LUMBER,

of various thicknesses, for CAR BUILDERS, which he is offering at *SIXTEEN (16) CENTS* per foot, BOARD MEASURE, hard close-grain *FRONTERA MAHOGANY.*

French and American Burl Veneers, Birds-eye Maple and Ash Veneers, especially adapted for Car Panels, etc.

1-4, 3-8, and 1-2 inch Black Walnut, seasoned, for Panels.

PHELPS, DODGE & CO.,

Cliff St., between John and Fulton,

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IMPORTERS AND DEALERS IN

Tin and Roofing Plates

OF ALL SIZES AND KINDS.

Pig, Tin, Russia Sheet-Iron, Charcoal and Common Sheet-Iron, Lead, Sheet Zinc, Copper, Spelter, Solder, Antimony, Etc.

MANUFACTURERS OF

Copper, Brass and Wire.

Car Manufacturers.

Allison, W. C. & Sons	Philadelphia Pa.
Anderson, J. R. & Co	Richmond, Va.
Altoona Manufacturing Co	Altoona, Pa.
Adrian Car Co	Adrian, Mich.
Arlington Car Manufacturing Co	Arlington, Vt.
Atlantic Car-Works	Salem, Mass.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canada Steam-Engine Co	Kingston, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
Corunna Car Co	Corunna, Mich.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Detroit Car and Manufacturing Co	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Fremont Car Co	Fremont, Ohio.
Gardner, F. & Co	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heathcote, Herbst & Co	Glen Rock, Pa.
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Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield, Ill.
Mansfield Machine-Works	Mansfield, Ohio.
Michigan Car Co	Detroit, Mich.
McNairy, Claflen & Co	Cleveland, Ohio.
Murray, Dougall & Co	Milton, Pa.
McVay, Walker & Co	Braddock's Field, Pa.
Mowry Car and Wheel Works	Cincinnati, O.
Middletown Car & Manufacturing Co	Middletown, Pa.
Missouri Car and Foundry Co	St. Louis, Mo.
Myers, H. S. & Co. (small cars)	York, Pa.
New-Haven Car Co	New-Haven, Ct.
Niblo, James M	Conshohocken, Pa.
Northumberland Car & Mfg. Co	Northumberland, Pa.
Ohio Falls Car Co	Jeffersonville, Ind
Ontario Car Co	London, Ont.
Oxford Co-operative Car Co	Oxford, Pa.
Patten Car-Works	Bath, Maine.
Peabody & Crangle Bro's	Calais, Me.
Peters, Simon	Quebec.
Petersburg Car Co	Petersburg, Va.
Piqua Car and Agricultural Works	Piqua, Ohio.
Pittsburg Car-Works	Pittsburg, Pa.
Pittsburg and McKeesport Car Co	McKeesport, Pa.
Pittsburg Car and Locomotive Co	Pittsburg, Pa.
Portland Co	Portland, Me.
Pullman Car Co	Chicago.
Peregoy, J. H	Houston, Texas.
Ranlet Car Manufacturing Co	Laconia, N. H.
Russell & Co	Massillon, Ohio.
Sands, William L	Pottstown, Pa.
Schall, Michael	York, Pa.
Schenectady Car-Works	Schenectady, N. Y.
Shaaber & Johnston	Reading, Pa.
Southern Car-Works	Independence, La.
South-Western Car Co	Jeffersonville, Ind.
Shoenberger & Bryant	Duluth, Minn.
Seath & Hager	Terre Haute, Ind.
St. Charles Manufacturing Co	St. Charles, Mo.
Stephenson, John & Co	New-York, N. Y.
Star Mining & Manufacturing Co	Henderson, Ky.
Taunton Car Co	Taunton, Mass
Tredegar Co	Richmond, Va.
Tiffin Car-Works	Tiffin, Ohio.
Vigo Foundry and Terre Haute Car-Works	Terre Haute, Ind.
Watsontown Car Co	Watsontown, Pa.
Wharton, Thomas J	Brunswick, Ga.
Whittaker, Phillips & Co	Toledo, Ohio.
Wason Manufacturing Co	Springfield, Mass
Weimer, P L & Bros	Lebanon, Pa.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.
Wells, French & Co	Chicago, Ill.
Wilmington Car-Works	Wilmington, Del.

Car-Wheel Manufacturers.

Albany Car-Wheel Works	Albany, N. Y.
American Paper Car-Wheel Co	Hudson, N. Y.
Atlantic Iron-Works	Portsmouth, Va.
Baltimore Car-Wheel Foundry Co	Baltimore, Md.
Barnum & Richardson Manufacturing Co	Chicago, Ill.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Bass & Hanna	Fort Wayne, Ind.
Bailey, Howson & Co	St. Paul, Minn.
Blanchard & Arnold	Milwaukee, Wis.
Boston Car-Wheel Co	Camb'gep't, Mass.
Bowler, Mayer & Brayton	Cleveland, Ohio.
Chicago Car-Wheel Co	Chicago, Ill.
Davenport, Fairbairn & Co	Erie, Pa.
Dawson Manufacturing Co	Dawson, Ga.
Detroit Car-Wheel Works	Detroit, Mich.
Fulton Foundry Co	Cleveland, Ohio.
Gill, John L, Jr	Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co	St. Louis, Mo.
Hamtramck Car-Wheel Works	Detroit, Mich.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heartt, Jonas S. & Co	Troy, N. Y.
Jackson & Woodin	Berwick, Pa.
John L. Gill	Columbus, Ohio.
Lehigh Car-Wheel & Axle Works	Catasauqua, Pa.
Lobdell Car-Wheel Works	Wilmington, Del.
London Car-Wheel Co	London, Can.
Louisville Car-Wheel & Railway Supply Co	Louisville, Ky.
Middlebrook & Mack	Oswego, N. Y.
Missouri Car and Foundry Co	St. Louis, Mo.
Moore Elastic Car-Wheel Co	Jersey City, N. J.
Mowry Car and Wheel Works	Cincinnati, Ohio.
Ohio Falls Car Co	Jeffersonville, Ind.
Pettengill, Glass & Co	Cleveland, Ohio.
Quealey, W. J	Hannibal, Mo.
Ramapo Wheel & Foundry Co	Ramapo, N. Y.
Rutland Foundry & Machine Co	Rutland, Vt.
Sterling Car-Wheel Foundry	Columbus, Ohio.
Scoville, J. & N. C	Buffalo, N. Y.
St. Louis Car-Wheel Co	St. Louis, Mo.
Taylor Iron Works	High Bridge, N. J.
Thompson, Duglas	Bordentown, N. J.
Tredegar Company	Richmond, Va.
Toronto Car-Wheel Co	Toronto, Can.
Washburn, Hunts & Co	Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co	Worcester, Mass.
Wason Manufacturing Co	Springfield, Mass.
Whitney A. & Sons	Philadelphia, Pa.
Woodbury & Company	E. Cambr'ge, Mass.
Wyoming Valley Manufacturing Co	Wilkesbarre, Pa.

Locomotive Builders.

Baldwin Locomotive Works	Philadelphia, Pa.
Brooks Locomotive Works	Dunkirk, N. Y.
Danforth & Cooke	Paterson, N. J.
Dawson & Baily (light locomotives)	Connellsville, Pa.
Dickson Manufacturing Co	Scranton, Pa.
Grant Locomotive Works	Paterson, N. J.
Hinckley Locomotive Works	Boston, Mass.
Manchester Locomotive Works	Manchester, N. H.
Mason, William	Taunton, Mass.
McKay Iron and Locomotive Works	Jersey City, N J.
Portland Company	Portland, Me.
Porter, Bell & Co. (light locomotives)	Pittsburg, Pa.
Pittsburg Locomotive Works	Pittsburg, Pa.
Rogers Locomotive Works	Paterson, N. J.
Rhode Island Locomotive Works	Providence, R. I.
Schenectady Locomotive Works	Schenectady, N. Y.
Taunton Locomotive Works	Taunton, Mass.

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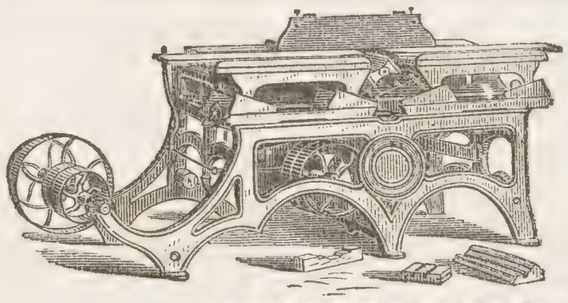

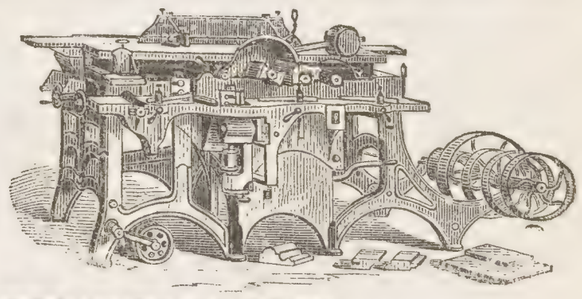

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A

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Alexandria & Fredericksburg			Alexandria, Va.
Alexandria, Nebraska & Iowa	Geo. Q. Adams		Alexandria, Mo.
Atchison, Topeka & Santa Fe	H. V. Farris		Topeka, Kans.
Atchison & Nebraska	Selah Williams		Atchison, Kan.
Alabama & Chattanooga	T. H. Kennedy		Chattanooga, Tenn.
Atlanta & West-Point	Wm. Rushton		Atlanta, Ga.
Atlanta & West Point		R. D. Cole	Newnan, Ga.
Atlantic & Gulf	C. E. Van Vorst	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
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Atlantic & Great Western	William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Haggard	Cleveland, Ohio.
Atlantic & Great Western	‖J. B. Miller.	S. V. Smith	Kent, Ohio.
Atlantic & Great Western	Allen Cook	J. W. Holmes	Galion, Ohio.
Atlantic & Pacific	§John Hewitt	E. Martin	St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South-Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
Allegheny Valley	G. W. Glass	R. Gunning	Pittsburg, Pa.
Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.

B

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Baltimore & Ohio		James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott		Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
Central Ohio Division	Alex. Platt		Zanesville, Ohio.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, Ohio.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Maine.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere Delaware	R. McDowell	John Silvers	Lambertville, N. J.
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Boston & Albany	A. B. Underhill	W. E. Chamberlain	Allston, Mass.
Boston & Providence	George Richards.	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson.	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
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Blue Ridge			Anderson, S. C.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer.	Jacob Williams	Oil City, Pa.

C

Cairo & Fulton	L. Finlay	L. Finlay	Little Rock, Ark.
California Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern	C. E. Benton	C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach.	Catasauqua, Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Charleston & Savannah	H. T. Calder		Charleston, S. C
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bossinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co.	H. T. Calder		Burlington, Vt.
Chesnire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. Q. Seats	Columbia, S. C.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Wiscon. Mad. & Mill. Divis			Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender.	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	J. D. Besler	Galesburg, Ill.
Creston Division	Joel West		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan	W. H. Dunham,	Danville, Ill.
Chicago & Canada Southern	§§J. Johann		Trenton Mich.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
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Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Divison	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen.	W. H. H. Allison.	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman.	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers			Lyndon, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	J. W. Sauerbach	Mt. Savage, Md.
Central of Georgia	D. D. Arden	C. C. Millar.	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div.	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas.
Central R. R. of Iowa	F. B. Woodruff	T. L. Seevers	Marshall, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.

D

Dakota Southern	Jas. Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Des Moines Valley	James Lamb	R. E. Smith	Keokuk, Iowa.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. G. Roberts		Detroit, Mich.
Delaware & Hudson Canal Co	James Dickson	Thomas Orchard	Carbondale, Pa.
Rensselaer & Saratoga Div.	John Dikeman		Troy, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rolls	James Rolls	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.

E

Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
East Pennsylvania		Samuel Reeves	Reading, Pa
Elizabethtown and Paducah	W. D. Robb	T. A. Cordrey	Elizabethtown, Ky.
Erie Railway	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna, Pa.
Erie Railway	‖V. Blackburn		Jersey City, N. J.
Erie Railway	‖F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E. Cooper	W. E. Cooper	Hornellsville, N. Y.
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind

F

Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.

G

Galveston, Harrisburg & San Antonio	Jno. G. Coulon		Galveston, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Richard Eaton	J. W. W. McWood.	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Sol. Bills	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson.	F. Childs	Hamilton, Canada.
Georgia	William Hardman.	T. M. Preval	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.

H

Harlem Extension	George W. Blanchard		Rutland, Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H. L Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	J. Salisbury	M. Tellerhoof	Saxton, Pa.
Hempfield	T. Marsh		Wheeling, Va.

I

Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. T. Sanford	R. B. More	Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.

J

Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind
Junction & Breakwater	J. A. Maguire		Lewes, Del.

K

Kansas Central	John Davis		Leavenworth, Kan.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh.		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas.	Chester, S. C.

L

Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey	E. R. Brown, Mauch Chunk, Pa.	South-Easton, Pa.
Lehigh Valley	P. Hofecker		Wilkatherly, Pa.
Lehigh Valley	A. Mitchell		De'ano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson.	C. A. Thompson	Hunter's Point, IL
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River, Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbr ck	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Macon & Western	D. M. Gogul	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta & Pittsburg	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	M. Thornton	M Thornton	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Memphis & Little Rock	Tho. Rennells	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Mississippi Central	Henry Gibbon	John E. Becton	Water Valley, Miss
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific			Nebraska City, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere, Wis.
Milwaukee & St. Paul	T. S. Davis	Wm. E. Kittredge	Milwaukee, Wis.
Milwaukee & St. Paul		John Baillie	Milwaukee, Wis.
Milwaukee & St. Paul	J. Pattee	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
J'kson, Lans'g & Saginaw Div.			Jackson Mich.
Mississipi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio	B. S. Skates	John McHugh	Mobile, Ala.
		Jacob Huy	Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y.
New-York & Oswego Midland	‖Wm. H. Griggs	Wm. H. Griggs	Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, Jackson & Gt. Northern	N. Greener	N. Greener	New-Orleans, La.
Naugatuck	Henry Hanford	George. W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Northern	James W. Lander	Albert Langmaid	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div.	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H.J. Bookhammer	Jacob Williams	Oil City, Pa.
Oil Creek & Alleghany	H.J. Bookhammer	John Monks	Oil City, Pa.
Ohio & Mississippi		G. Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott	Chas. Hyatt	East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	J. D. Linning		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	John Hewitt	St Louis, Mo.
Pennsylvania	§§Frank Thomson		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division	John Headden	David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	James F. Elder	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis			
Pittsburg & Columbus Division	E. Pierce		Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Pendleton, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg. Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns		Connellsville, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Batties	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	C. W. Furber	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village N H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y

Q

Quincy, Alton & St. Louis	J. O. Grav l	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.

R

Raleigh & Gaston.	J. B. Gayle	J. B. Gayle	Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	H, Longest	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis & Iron Mountain	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogul	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Seaboard & Roanoke	§A. Pendleton		Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Daughtrey		Selma, Ala.
Selma, Rome & Dalton	A. G. Maynes	W W. Peirce	Selma, Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N. Y.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.

T

Taunton Branch.	W. M. Parks	J. G. Codding	Taunton, Mass.
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	W. H. Hipple		Marshall, Texas.
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn
Toledo, Wabash & Western	**G. W. Cushing	‖J. B. Morse	Fort Wayne, Ind.
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	‖James King		Springfield, Ill.
Toledo, Wabash & Western		‖U. H. Kohler	Toledo, Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Edward Cox	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vicksburg & Brunswick	James Boon	J. A. Knight	Eufaula, Ala.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	George Hall	W. J. Calais	Wilmington, N. C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Coatesville, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.

(Rema nder of List unavoidably crowded out.)

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
A			
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Albany, N. Y.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.
B			
Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.
C			
Cairo & Fulton	J. H. Morley	W. H. Hallett	Little Rock, Ark.
Cairo & St. Louis	C Hamilton		St. Louis, Mo.
Cairo & Vincennes	L. W Palmer		Cairo, Ill.
Camden & Atlantic	E. Collings		Camden, N. J.
Canada Southern	*J S. Casement		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Sacramento & Oregon Division	J. A. Fillmore		Sacramento, Cal.
Western & Visalia Division	E. C. Fellows		Oakland, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humbolt Division	R. S. Mattison		Carlin, Nevada.
Salt-Lake Division	R. H. Pratt		Ogden, Utah.
California & Pacific Division	A D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart		Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡W. B. Strong		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Pekin & Southwestern	N. J. T. Dana		Streator, Ill.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati,, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron		Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough		Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Akron, Ohio.
Colorado Central	T. E. Sickles		Golden, Col.
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
D			
Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	Milton Weston		New-York City.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware, Lackawanna & Western	W. F. Halstead	G. W. B. Cushing	Scranton, Pa.
Morris & Essex Division	Andrew Reasmer	G. W. Bleashing	Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Des Moines Valley	John Givin	G. E. Kilbourne	Keokuk, Iowa.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese		Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.
E			
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)	J. Prescott	C. W. Pratt	Boston, Mass.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Elizabethtown & Paducah	D. Brock		Elizabethtown, Ky.
Elizabethtown & Paducah	D. F. Whitcomb		Louisville, Ky.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.
F			
Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw, Mich.
Florida Central	F. P. Papy		Jacksonville, Fla.
Flushing & North-Side	I. D. Barton		Hunter's Point, L.I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.
G			
Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson		Augusta, Ga.
Gilman, Clinton & Springfield	S. H. Melvin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich
Grand Rapids & Indiana		Will am Mullins	Pittsburg, Pa.
Grand Trunk	C. J. Brydges	John Taylor	Montreal, Canada.
East Division	Henry Bailey		
West Division	W. J. Spicer		
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.
H			
Hannibal & St. Joseph	L. W. Towne	A. W. Lamb	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top	J. McKillips	B. A. Knight	Huntingdon, Pa.
I			
Illinois Central	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	George L. Barringer		Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell		Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.
J			
Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	S. Conant		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis	Horace Scott	Wm. Mullins	Pittsburg, Pa.
Junction & Breakwater	Wm. Groom		Lewis, Del.
K			
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		Detroit, Mich.
Kansas Pacific	Edward S. Bowen		Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo H Briggs		Keokuk, Iowa.
Knox & Lincoln	C. A. Combs	Oliver Morse	Bath, Maine.
L			
Lackawanna & Bloomsburg	D. T. Bound	G.W. B.Cushing	Kingston, Pa.
Lake Erie & Louisville	I. H. Burgcon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. H. Grant	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	Chas. B. Peck	E. O. Foote, Jr.	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
	L. Chamberlin		Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Maho y Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	J. C. Hadley		Terre Haute, Ind.
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L. I.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Robert Meek		Clarksville, Tenn.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	M. Stanton		Birmingham, Ala.
Louisville, Cin. & Lexington	George Skinner	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	M. Sloat	J. R. Parker	New-Albany, Ind.

M

Macon & Brunswick	William McRae	Solomon Hass	Macon, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta & Pittsburg	A. J. Warner	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	C. E. Van Cleve	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	A. S. Livermore		Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	H. E. Sargent		Detroit, Mich.
Michigan Central		John Newell	Detroit, Mich.
Grand River Valley Division	Chas. Desmond		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	Geo. C. Hopper		Saginaw City, Mich.
South-Haven Division	Geo. E. Curtiss		Kalamazoo, Mich.
Joliet Division	Carlton Wheeler		Joliet, Mich.
South-Bend Division			
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse		Lincoln, Neb.
Milwaukee, Lake Shore & Western	W. Elwell		Sheboygan, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Milwaukee & St. Paul	*S. S. Merrill	Rob't Wason	Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mississippi Central	R. N. Colquhoun		Water Valley, Miss.
Mississippi Central	*E. D Frost	A. S. Roberts	New-Orleans, La.
Mississippi & Tennessee	M. Burke	M. Burk	Memphis, Tenn.
Mississippi Valley & Western	E. P. Buell		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	F. W. Bowen	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Holden, Mo.
Eastern Division	Mark M. Towne		Hannibal, Mo.
Sedalia Division	Mark M. Towne		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allen Bowen	Kansas City, Mo.
Mobile & Ohio	L. J. Fleming	C. E. Rushing	Mobile, Ala.
	Cecil Fleming		Mobile, Ala.
	E. S. Hosford		Macon, Miss.
	M. M. Miller		Jackson, Tenn
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.

N

Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart	Thomas Williams	St. Stephen, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	M. W. Serat		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, Jackson & Great Northern	*E. D. Frost	S. H. Edgar	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. M. Wilcox		New-Haven, Ct.
New-York, Boston & Montreal	C L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast	C. V. DeForest	Albany, N. Y.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland	C. W. Douglas	P. Bundy	New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
Northern Pacific	*C. W. Mead	E. T. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	J. S. Redfield		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.

O

Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	J. J. Lawrence		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.

P

Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	G. Clinton Gardner	E. Lewis	Altoona, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	W. H. Brown		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pensacola & Louisville	Daniel H. Cram		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin	E. Lewis	Erie, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Blair		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	Hugh Pitcairn		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	Richard Wiggin		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	S. C. Millett		Port Royal, S. C.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y.
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.

Q

Quincy, Alton & St. Louis	N. D. Munson	D. A. Sweet	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.

R

Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	R. R. Cable		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.

S

St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lineoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St. Louis, Mo.
St. Louis & Iron Mountain	Arthur W. Soaper	W. S. Cuddy	St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. W. Gardiner	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	A. E. Shrader		Henderson, Ky.
St. Louis, Kansas City & Northern	W. C. Van Horne	R. W. Green	St. Louis, Mo.
St Louis Division	J. L. Hinkley		St. Louis, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific			
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	E. G. Barney		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Sheboygan, Wis.
Shenango & Allegheny	G. H. McKibbin		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern			Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South-Side, Long Island			
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern Minnesota	*H. W. Holley		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield & Ill. South-Eastern	G. W. Norris		Springfield, Ill.
Staten Island	J. W. Wlbur		New-York, N. Y.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Syracuse Northern	C. B. Morse	C. B. Morse	Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing	Syracuse, N. Y.

T

Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson		Indianapolis, Ind.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. Noble	J. F. Dixon	Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria & Warsaw	W. H. Cruger	Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio.
Western Division	Robt. Andrews		Springfield, Ill.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.

U

Union Pacific	T. E. Sickles	T. E. Sickles	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Ill.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City.
Utica & Black River	T. W. Spencer		Utica, N Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.

V

Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
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Western Division	John Schrier		Ogdensburg, N. Y.
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Vicksburg & Brunswick	Virgil Powers	H. Young	Eufaula, Ala.
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Western Union	D. A. Olin		Racine, Wis.
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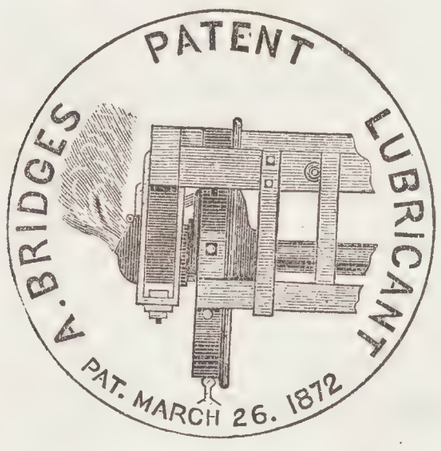

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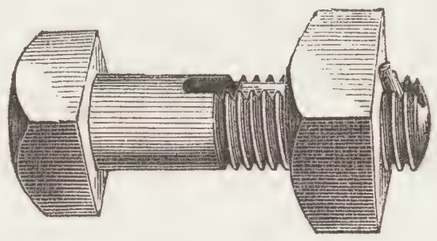
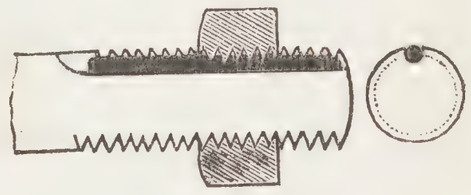


"CUMMING NUT-LOCK,"
Patented
June 16, 1868,
August 23, 1870.



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This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

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If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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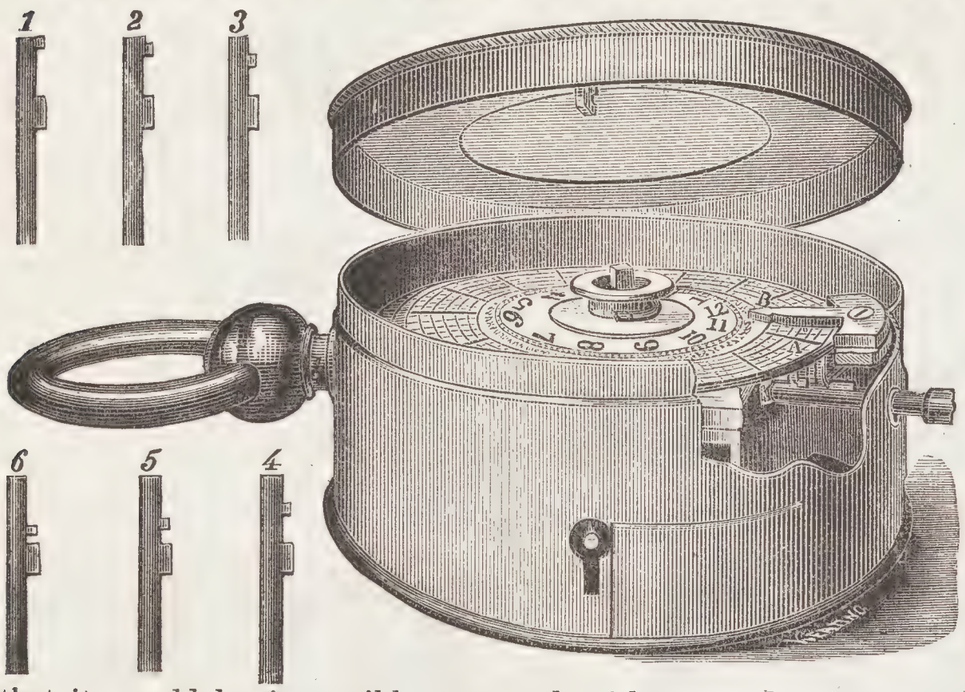

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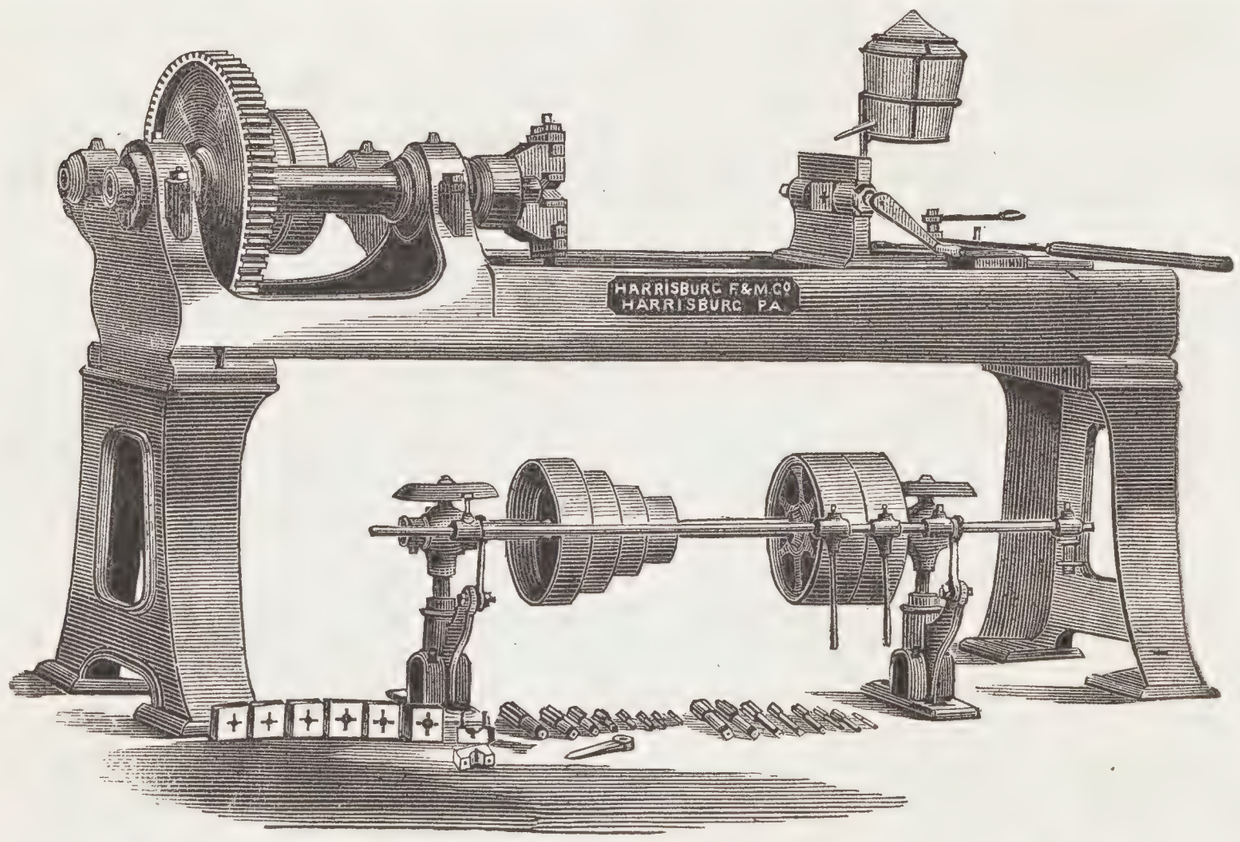

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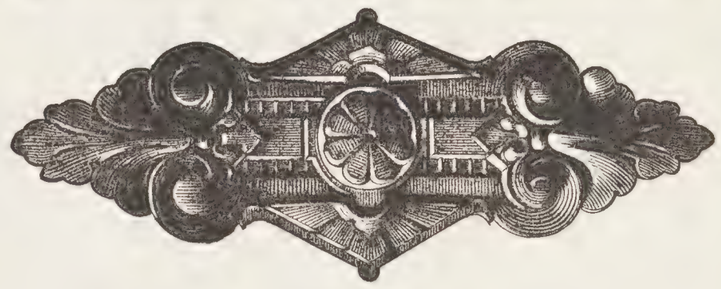

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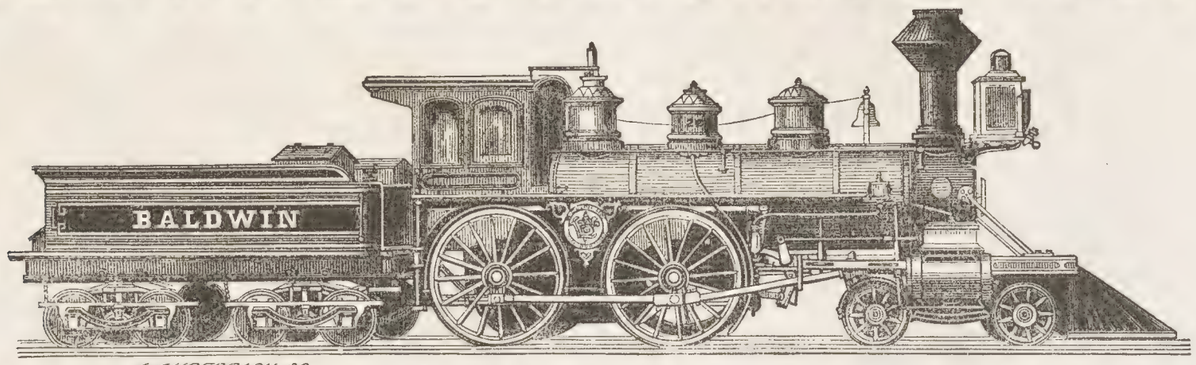

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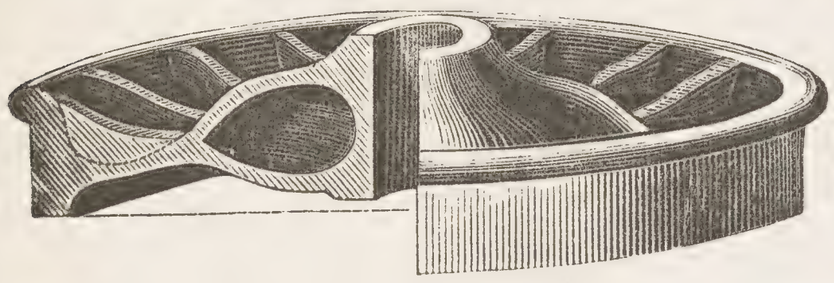

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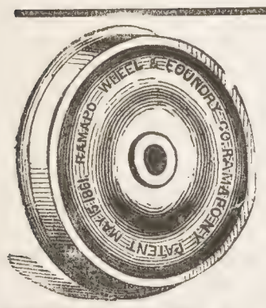

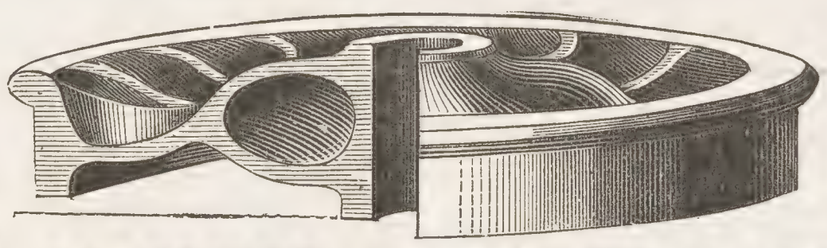

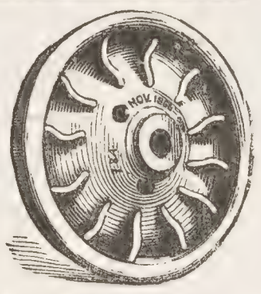

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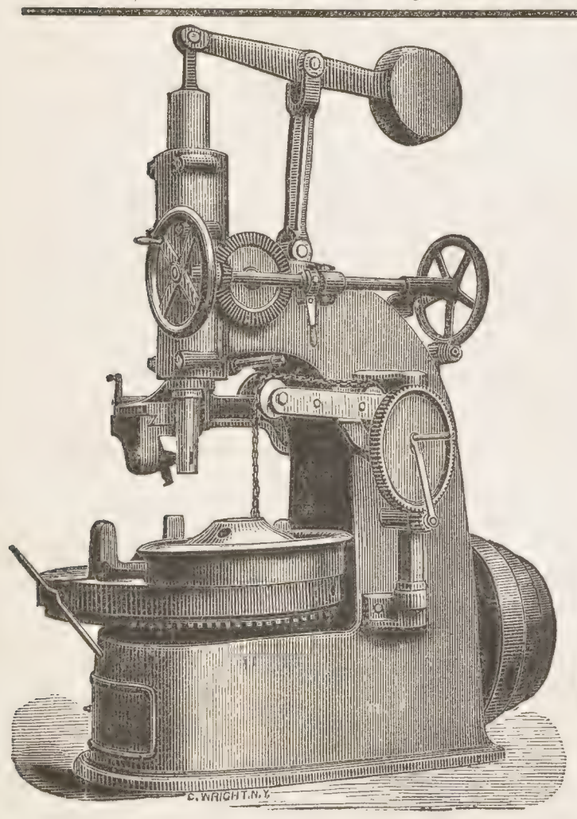

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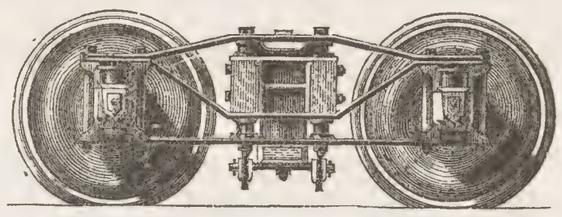

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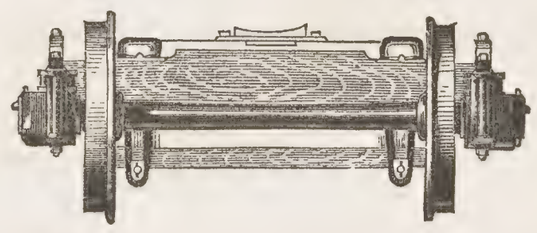

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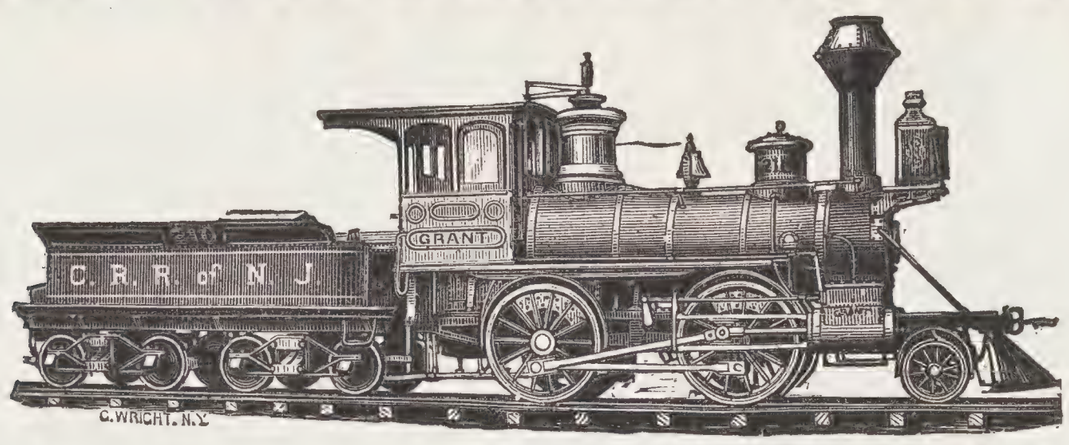

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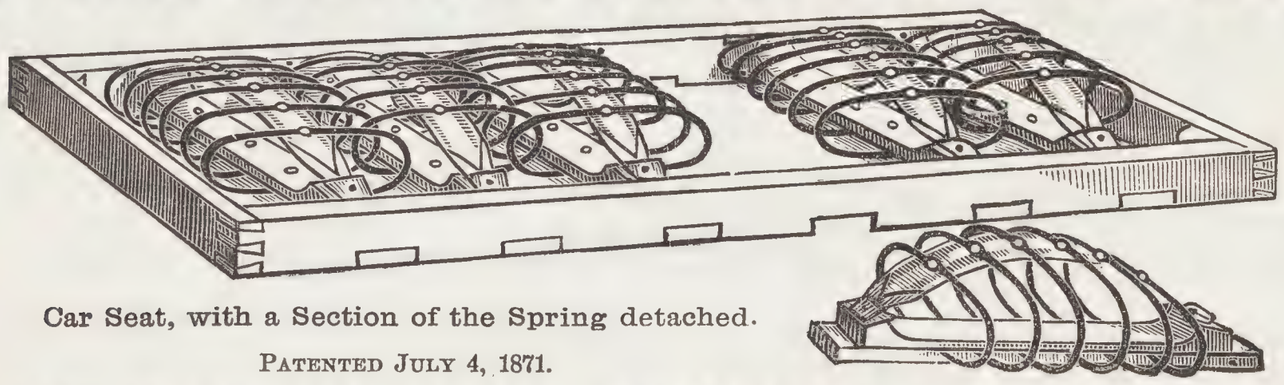

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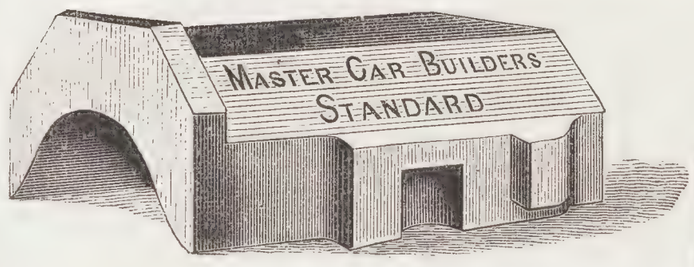

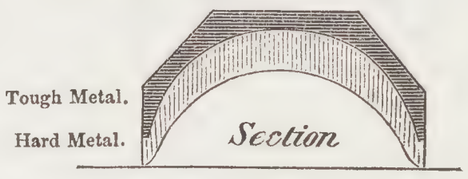

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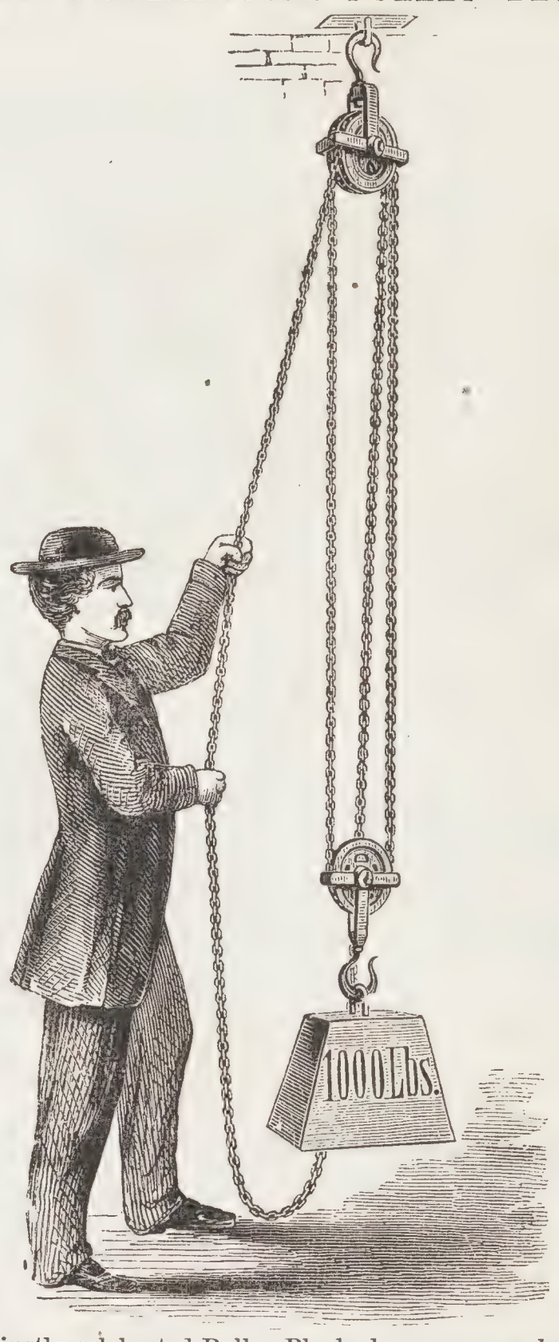

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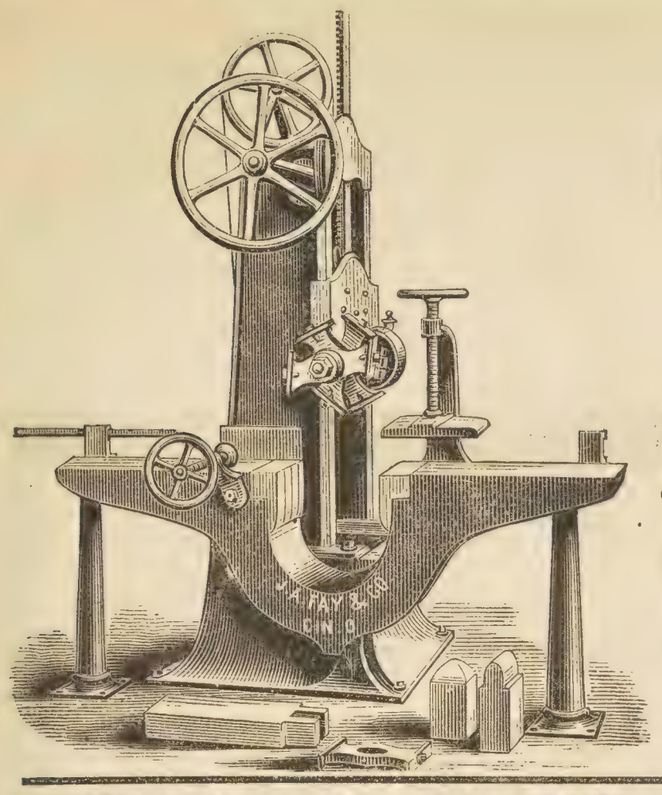

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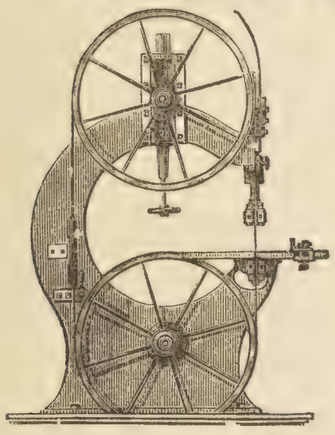

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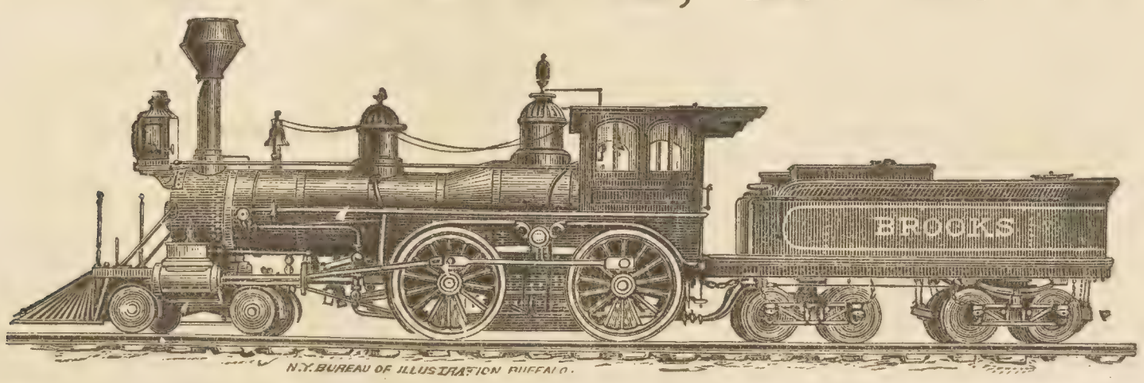

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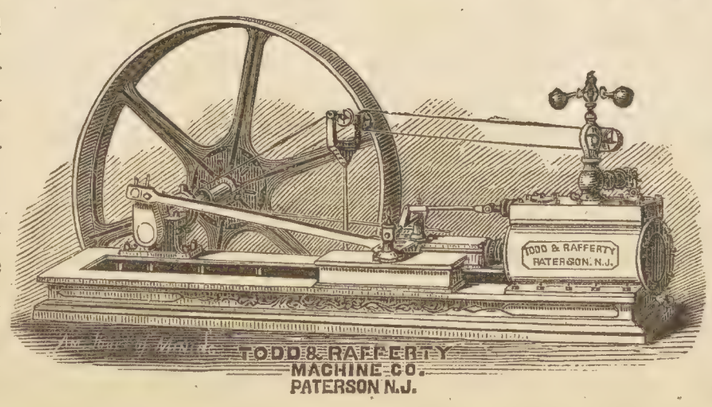

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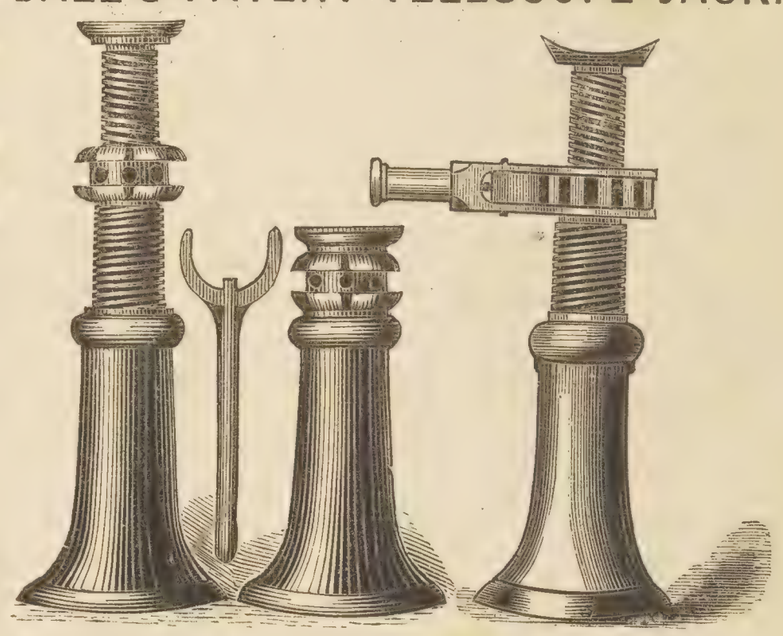

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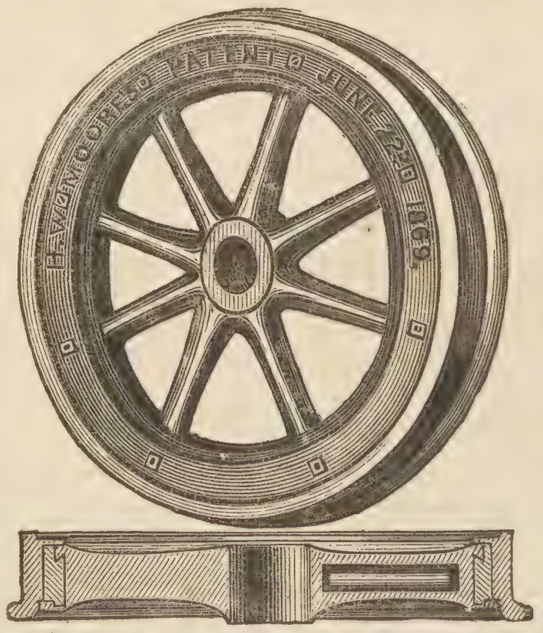

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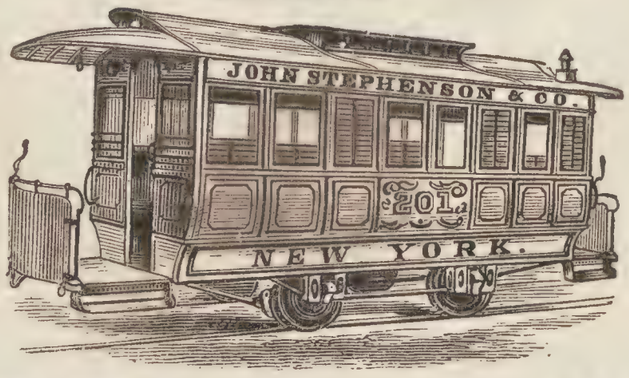

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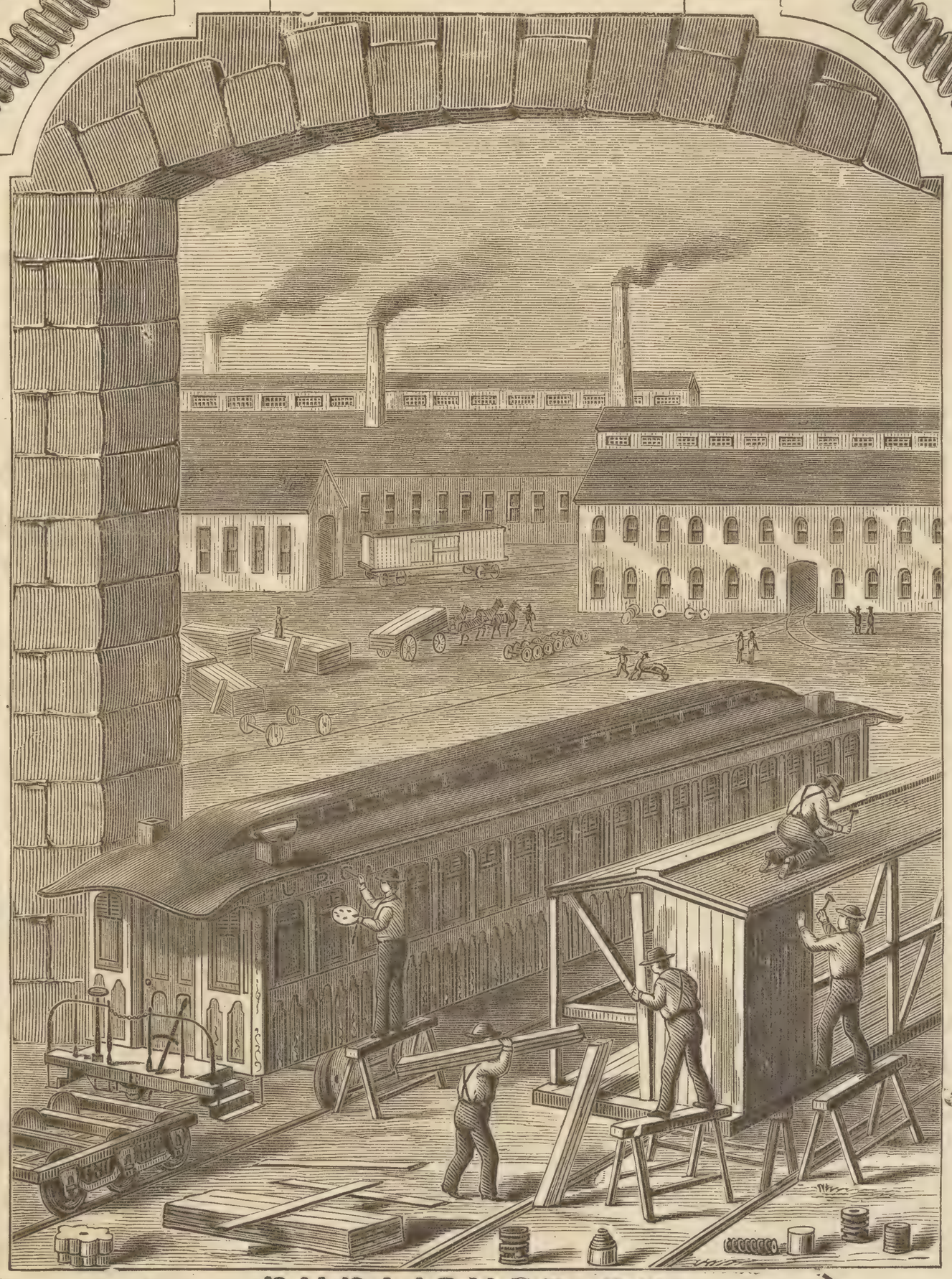
Vol. V. MAY, 1874. No. 5.



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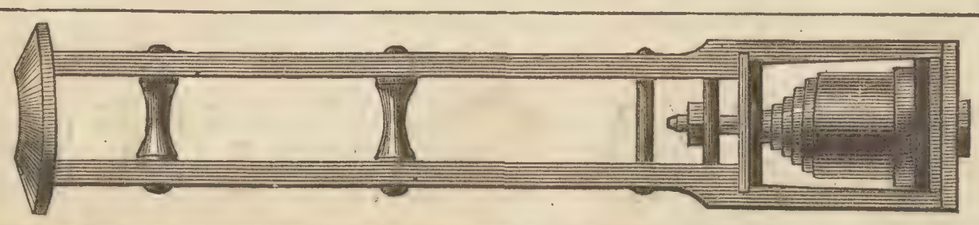

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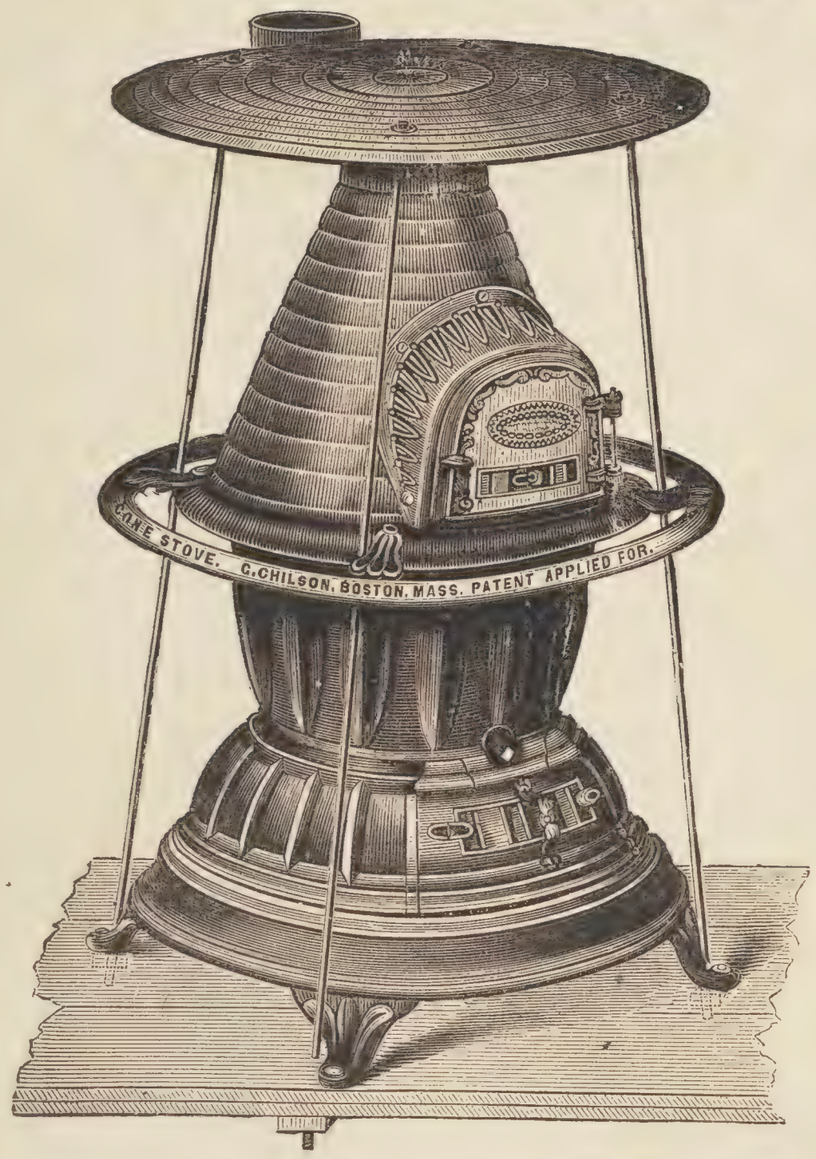

I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety, Economy, Durability, Simplicity, Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices,* RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

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Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

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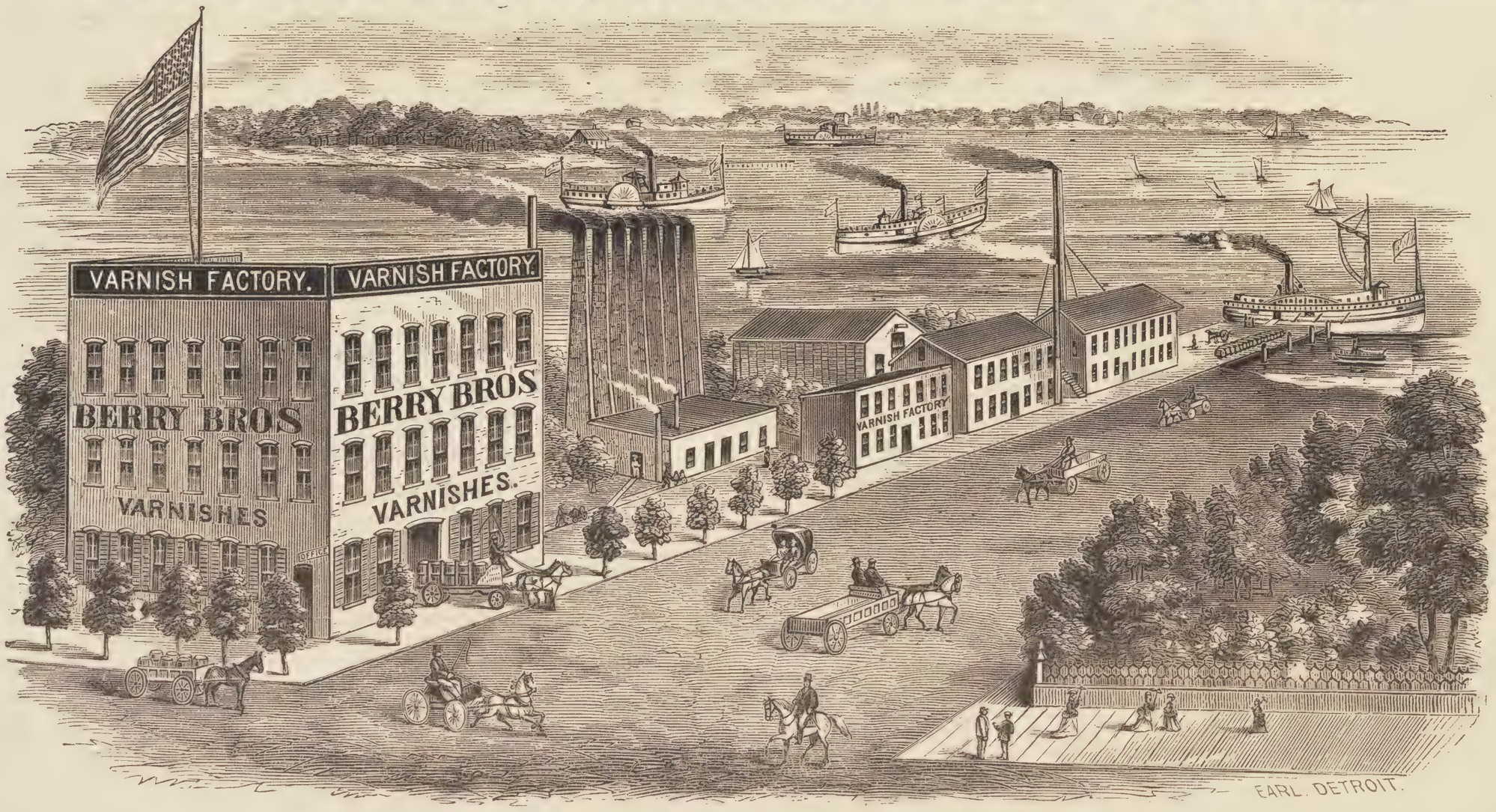

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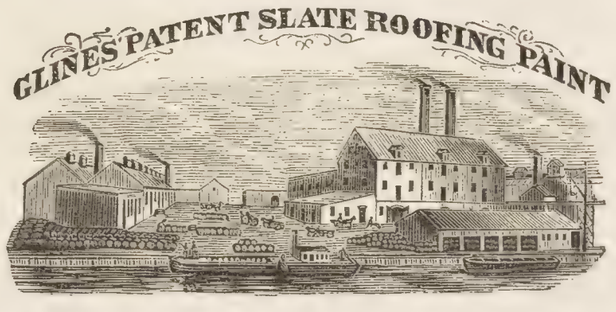

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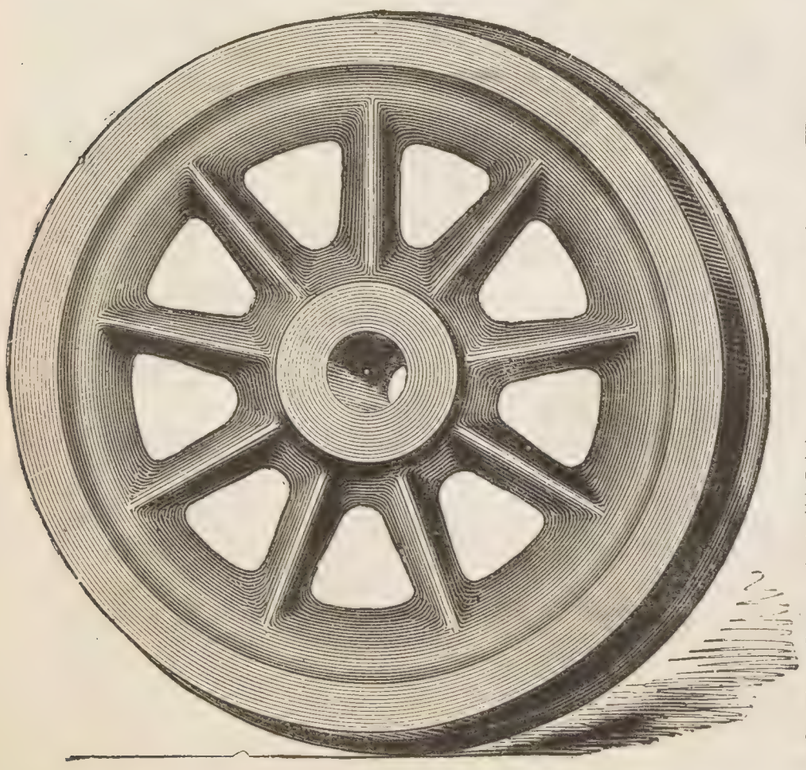

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Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

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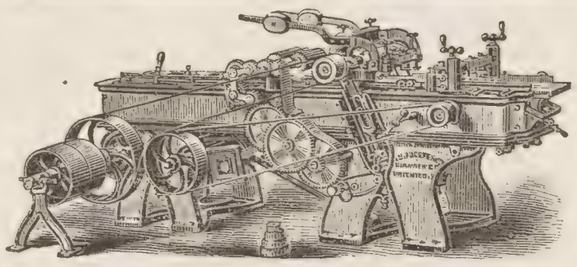

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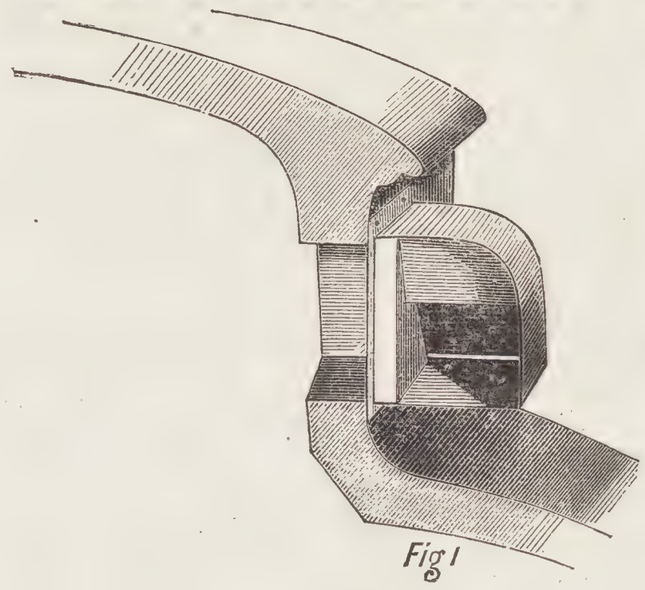

Fig 1

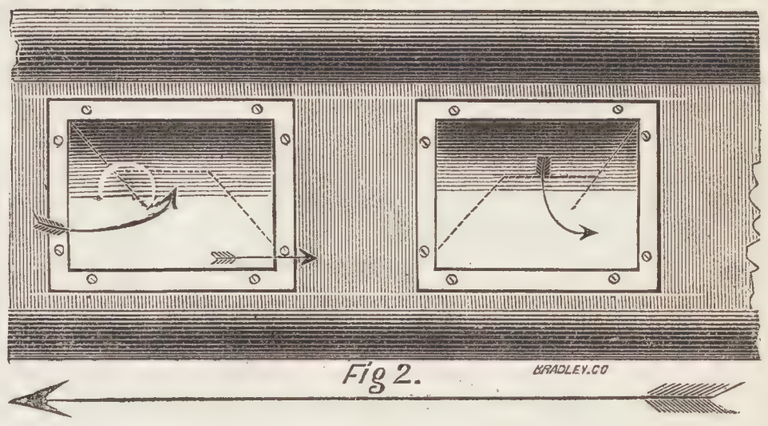

Fig 2. BRADLEY.CO

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

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MILLER'S TRUSSED PLATFORMS. Compression Buffers and Automatic Couplers for Railroad Passenger Cars.

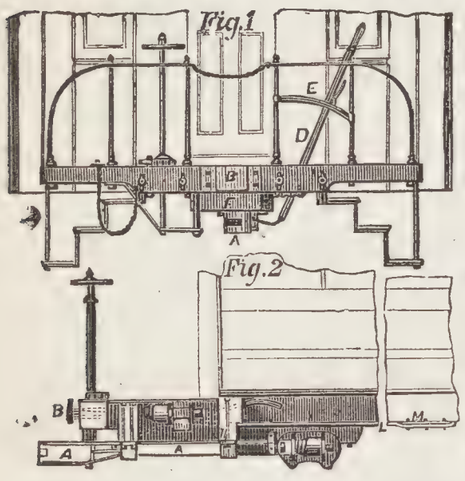

Fig. 1

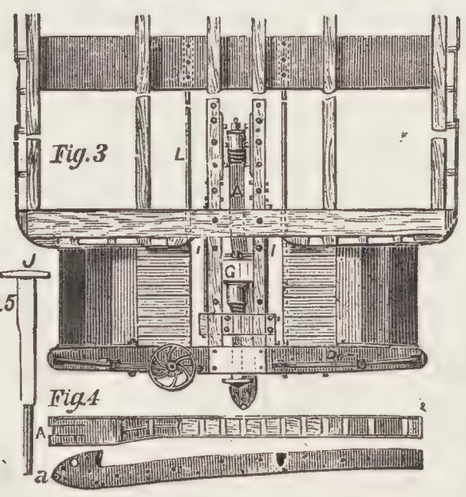

Fig. 3

Fig. 4

Fig. 5

Office, 231 Broadway, (Rooms 4 and 5,) New-York.

Send for Illustrated Pamphlet, and call and see working models. E. MILLER, Patentee.

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied: and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

DELAWARE CAR WORKS.

[Working Capacity, 1000 Men.]

Manufacturers of Sleeping, Saloon, Drawing-Room, Passenger, and Freight Cars of Every Gauge.

WANTED,

A SITUATION AS MASTER CAR BUILDER, by one who is thoroughly acquainted with the business, and can give the best of references.

Address, VOSE, DINSMORE & CO.,
ST. LOUIS.

THE
PETERSBURG CAR COMPANY,
Petersburg, Va.,

Are now ready to receive orders for all kinds of

FREIGHT CARS.

These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.

T. L. H. YOUNG, President. JOHN W. FLEMING, Superintendent.

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FOR
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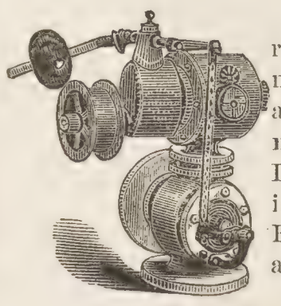
OVER FOUR THOUSAND NOW IN USE.



All Governors fully Warranted, and returnable in all cases where a trial does not prove its superiority over all others, as the **most Perfect, Reliable** and **Economical Steam Governor ever Invented.** It resembles, neither in principle nor in operation, any other Governor known. For Circulars of reference, or information, address

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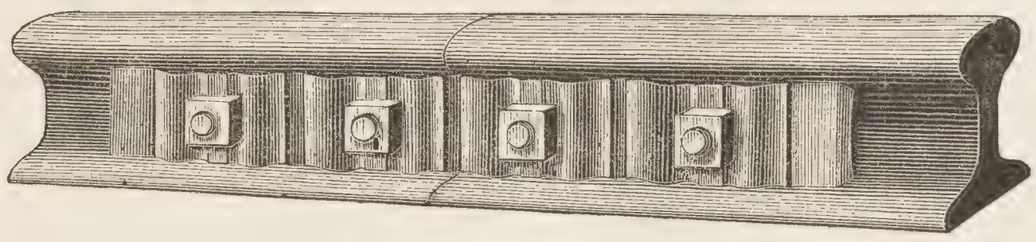
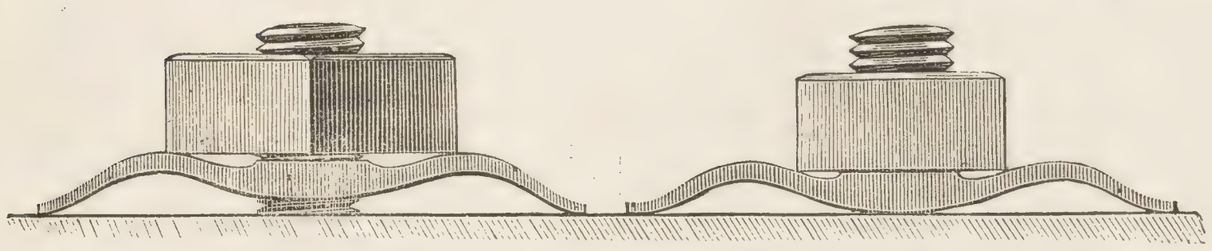
MILLER'S PATENT ELASTIC WASHER AND NUT LOCK,
FOR RAILROAD FISH JOINTS.





NUT SCREWED DOWN. SCREWED DOWN AND NUT LOCKED.

These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

Address *SWEETS MFG. CO., Syracuse, N. Y.*

ESTABLISHED 1827.

EDWARD SMITH & CO.,
MANUFACTURERS OF
VARNISHES
AND SOLE AGENTS FOR
POST'S COACH COLORS,
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A GENTLEMAN of 20 years' experience as a "Car Builder," wants a position as Master Car-Builder on some Railroad. Can furnish best of references. Address

VOSE, DINSMORE & CO.,
32 Warren Street, N. Y.

NOYES' PATENT LIQUID PACKING,
For Cooling Railroad Car Journals and Bearings of all kinds.

What we Claim for it is:

That it will cool a journal while a car is in motion, and that its use will in a great measure prevent its occurrence, saving expense, delays, and accidents; that mixed with mineral oil it gives a soft, heavy body, essential elements which this oil lacks, especially in warm weather, besides keeping it sweet and preventing oxidation; that a journal will wear longer and with less friction, and be better and more thoroughly oiled; that the heat from the journal is thrown off at a temperature below that required to melt the babbitt, saving it from being destroyed, and preventing an accumulation of heat; that there is less liability of waste packing of journal getting on fire, as the non-inflammable elements of the Liquid permeate the waste and prevent it; that it will cause a considerable saving in the expense of oiling, as it imparts additional lubricating qualities, as well as body, which prevents waste from running off, keeps the journal smooth and polished, and hardens the bearings; that a trial will satisfactorily demonstrate its superiority to sperm and lard oil, and that used according to directions it is even cheaper than mineral oil, which is the lowest-priced lubricating oil in the market.

We do not claim the LIQUID PACKING as a *durable* lubricator of itself alone, but when used with good mineral oil, according to directions, we do claim that it constitutes a cheaper, better, and more durable lubricator than any thing offered for the purpose, under whatever name.

One thorough application of the Liquid on a hot journal will do more execution in cooling, than the constant application of water for half an hour, besides doing it evenly and without loss of time.

DIRECTIONS FOR USING:

FOR COOLING OFF A HOT JOURNAL WHEN CARS ARE IN MOTION.—For this purpose procure a can holding two gallons, the nozzle having an outlet of not less than half an inch, and always keep it well filled with the LIQUID PACKING for immediate use. When a hot journal is discovered, apply the LIQUID slowly, first giving the contents of the can a thorough shaking, and then proceed. Examine journal at next station, and if not cooled down to a proper temperature, apply again, and so on until it is accomplished, then fill up the box with native lubricating oil; this is particularly necessary in all cases where animal oil is used as a lubricant. In all ordinary cases this treatment will effectually cool off a journal in a short time, and without causing scarcely any delay of train. *Where a box is on fire,* pour on the LIQUID, which will extinguish the fire immediately. In extreme cases, where the babbitt metal has melted, or where journals are extremely rough, the journal may become hot again. If so, repeat application of LIQUID as directed, and then fill up box with native oil, and so on as often as may be necessary to the end of route. A can of the LIQUID PACKING, together with a can of native oil, will insure the safe delivery of cars troubled with hot journals, with scarcely any delay. A smoky and hazy emanation from boxes in which the LIQUID is used, simply indicates a rough journal, and that the heat is being conveyed away from it. In such cases look to it occasionally, and keep it well supplied with the LIQUID. Should the LIQUID become too thick to run freely from the nozzle of can, from the action of the weather, thin to the required consistency with mineral oil.

FOR A GENERAL LUBRICATOR.—Add one part of LIQUID PACKING to two parts of native West-Virginia or paraffine oil, and use in regular way. Or, if preferred instead, use the LIQUID PACKING in every third or fourth oiling, according to the temperature of the weather and quality of oil. Used in this way, aside from its cooling qualities, it makes a lubricator that can not be excelled in price and quality.

WHAT RAILROAD MEN SAY OF IT.

PERSON NOYES, Esq.,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent evaporation; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Bell and Leather Stuffing Co., CHICAGO, DEC. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

OFFICE OF NORTHERN RAILROAD,
MR. P. NOYES: CONCORD, N. H., May 26, 1872.

Dear Sir:—Send to this corporation a barrel of your LIQUID PACKING. The sample package cooled four hot boxes within a distance of eight miles. I shall have a can on board each train, for it gives perfect satisfaction. A. LANGMAID.

P. NOYES, Esq.: ALBANY, NOV. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report;

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

NEW-YORK, PROVIDENCE, AND BOSTON R. R. Co.,
BELT AND LEATHER STUFFING CO.: PROVIDENCE, Aug. 3, 1870.

Gentlemen:—Some two months since I received from you a can (1 1-2 gals.) of your LIQUID PACKING for cooling journal bearings on cars; I have just repaired and put to running an engine; the first trip the truck boxes (all new) heated badly. I gave the LIQUID PACKING to the engineer, and instructed him to use it according to directions. The consequence was that we had no more hot truck boxes. I was so well satisfied with it that I ordered a barrel, and for the past month, when we have a hot box on any of our cars, we apply at once your LIQUID PACKING, which has in all cases, thus far, cooled the journal so as to give no further trouble or delay. During the past two weeks we have received from the Taunton Car Co. four new passenger cars; the two first, when received by us from Taunton, had each journal *very hot*, with the babbitt metal melted out of brass shells; I renewed the metals and packed them with your LIQUID PACKING. The cars have been running 150 miles each day ever since, with *no more hot boxes.* Some ten days since we received from the N. L. & N. H. R. R., at the Ferry Boat at Groton, (through express train from New-York to Boston, shore line,) a car having a red-hot box; your PACKING was at once applied, cooling the journal so that the men were able in a few moments to put in a new metal; they then repacked with your LIQUID PACKING, according to your printed directions, and the car came into Providence, a distance of sixty-three miles, perfectly cool, without any further trouble. If it continues to work as well, I can not do without it. I cheerfully recommend it to all Railroads, as being an article which they will find invaluable in all cases of hot journals.

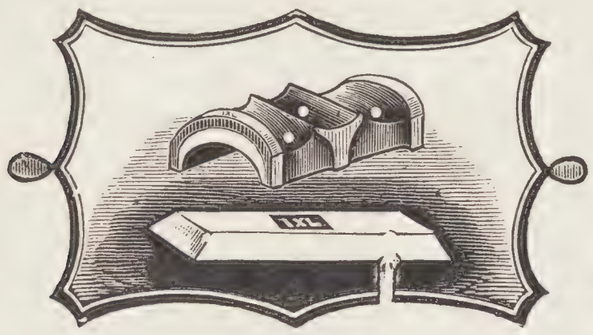
J. H. ANDERSON, *Master Mechanic.*

Send for a Barrel. No charge unless it does all we state.

Manufactured by the Belt and Leather Stuffing Co.,
47 INDIA STREET, BOSTON.

Sold by Vose, Dinsmore & Co., New-York.

ORGANIZED MAY 1869.



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Railroad Companies will find a great saving in their expenses, and very little trouble from hot boxes, by using these bearings. A sample set for a trial sent free of charge, by sending a Brass for pattern. Mills, Steamboat Companies or others, will find this a superior Composition for Bearings.

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Make a ***Specialty of Freight Car Forgings*** and ***Castings*** delivered to Shops. Also ***Locomotive Cylinders, Frogs and Switches.*** Address,

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[Established in 1851.]

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EITHER OF IRON OR WOOD.

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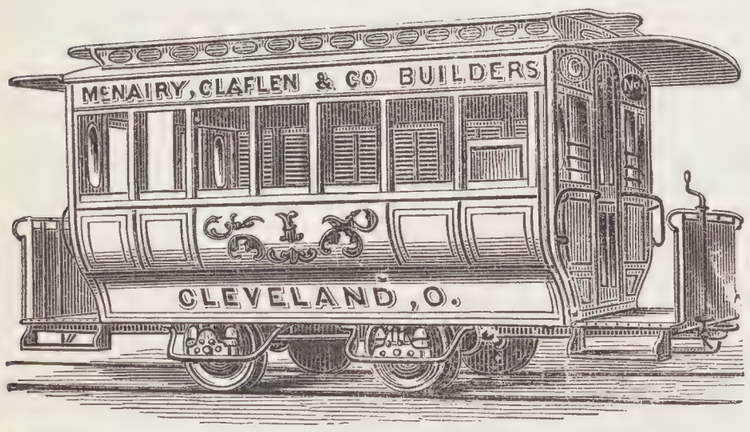
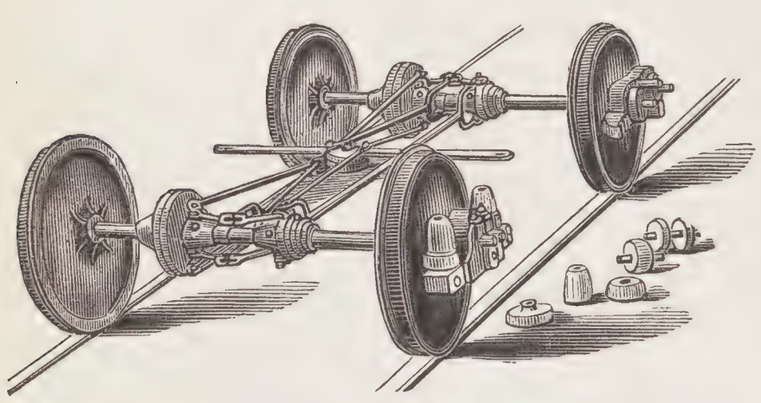


The Lightest Running, Easiest Riding, Most Durable, and Most Economical Street Car in Use.



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This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY. I. & ST. L. R. R.
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Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

Brinckerhoff, Turner & Co.,

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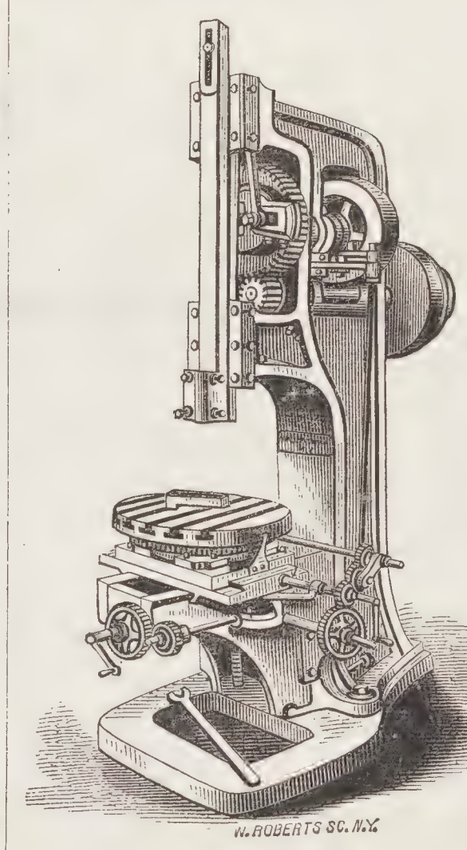

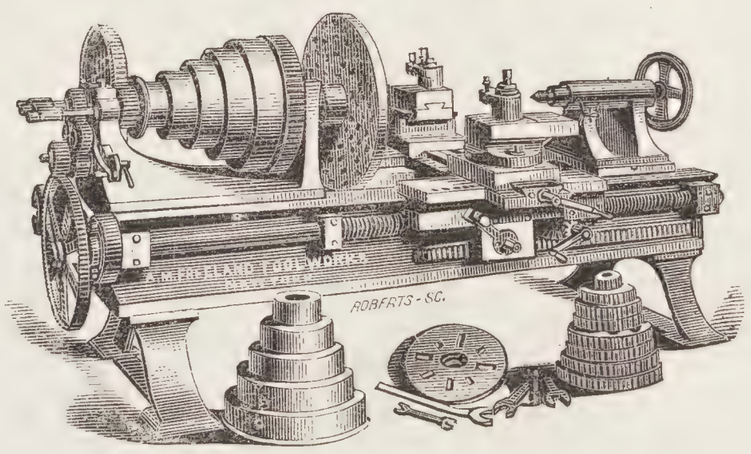

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We desire to call the attention of parties interested in Architectural Work or Bridge-Building to our New Style of Trimming Machine for squaring the ends of columns to any length desired, squaring both ends at once, and requiring no changing of Tools, or shifting of work. Several of these machines are now in operation in this city and give great satisfaction. Our Tools have been in use for upwards of thirty years, and are well and favorably known throughout the country. Send for Photographs.

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Half Elastic Varnish Brushes

SUPERIOR TO ANY IN USE.

BRUSHES OF EVERY DESCRIPTION

On Hand, and Made to Order.

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THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

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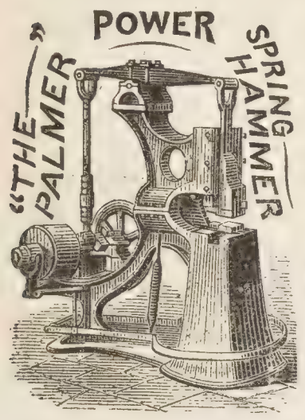

Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

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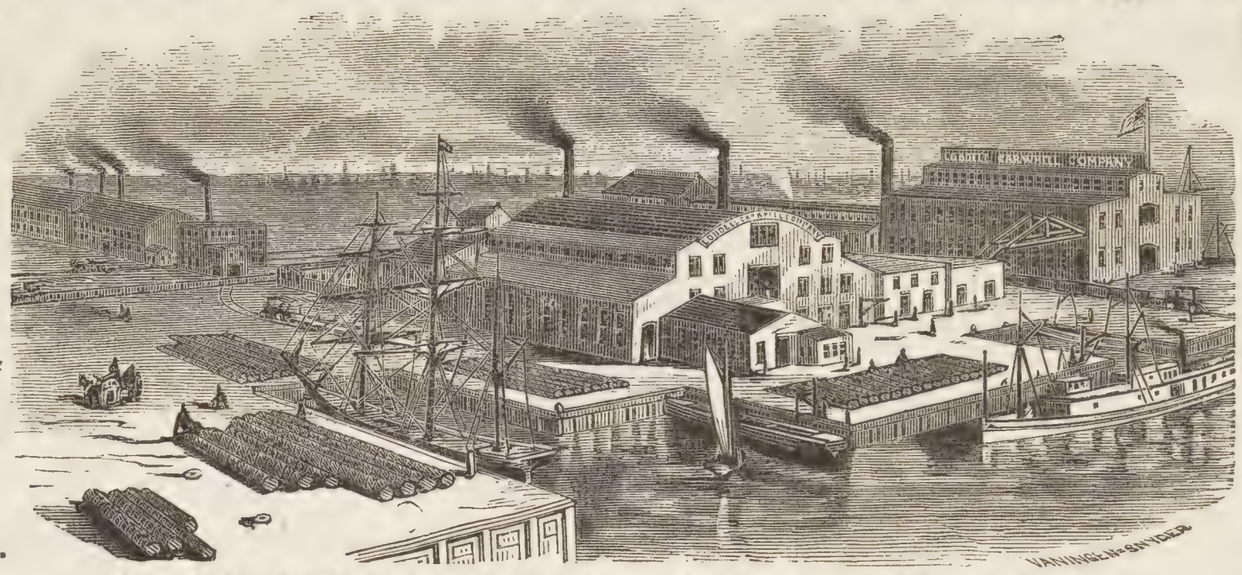
SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



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THE HARLAN & HOLLINGSWORTH CO.,

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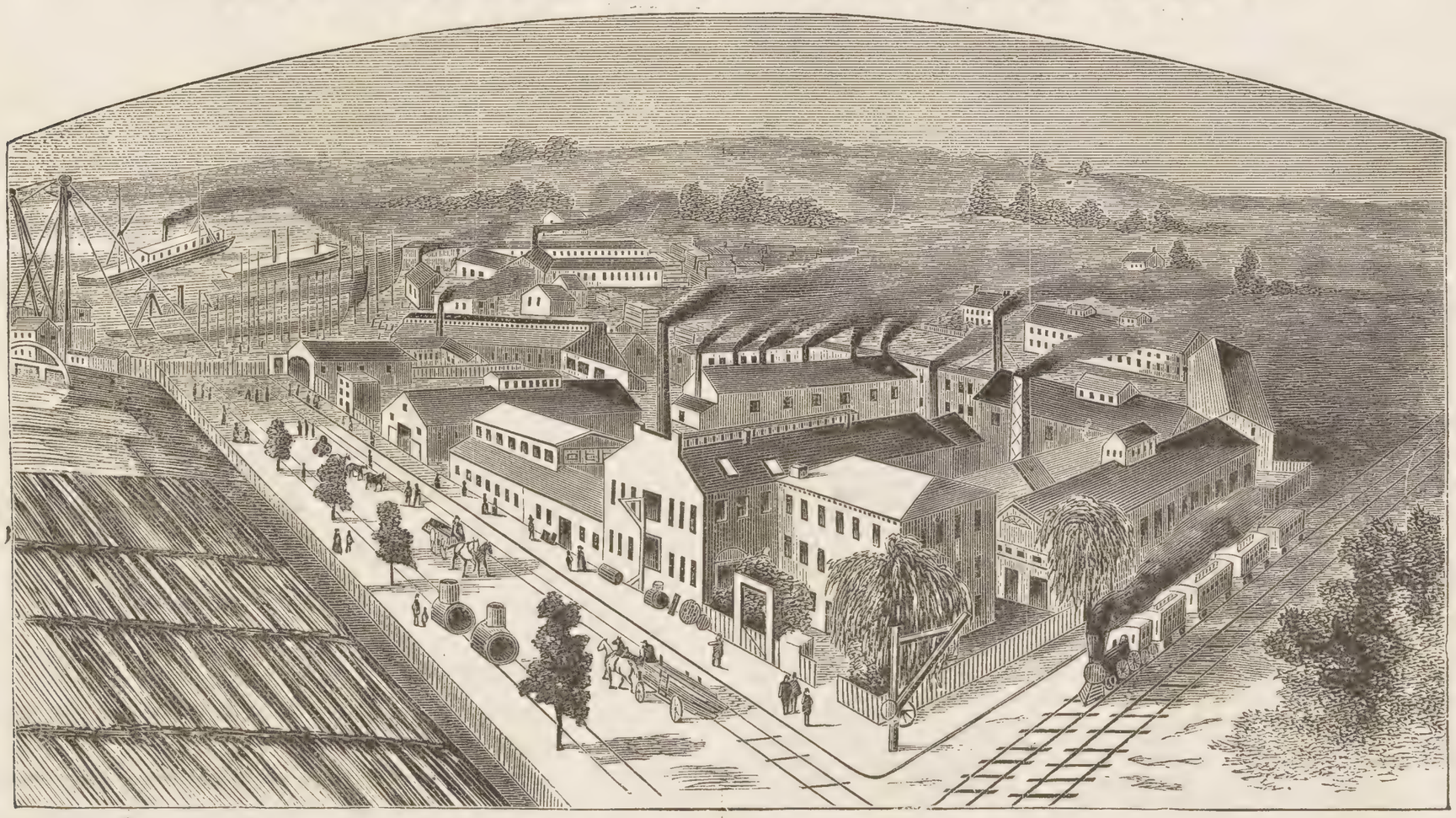

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RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

WM. H. MURPHY. JAS. G. BARNET. FRANKLIN MURPHY.

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SPECIAL ATTENTION PAID TO

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Outside Finishing,	$5.50	Engine,	$5.00
Outside Rubbing,	4.50	Coach-makers' Japan,	2.00
Inside Car,	4.50	Black Japan,	1.50

These goods are now in use on the principal Railways of the country, and have had a success never before reached by any others. For Railway uses they are **Superior** to the imported.

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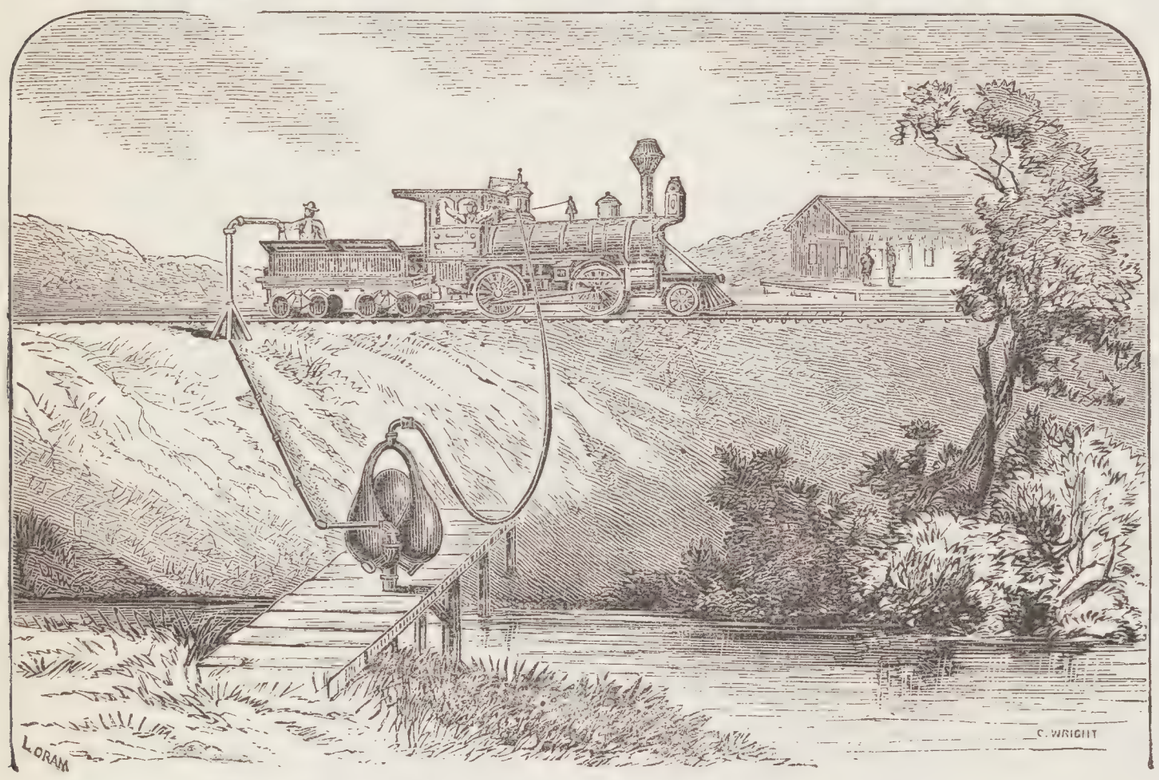

APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

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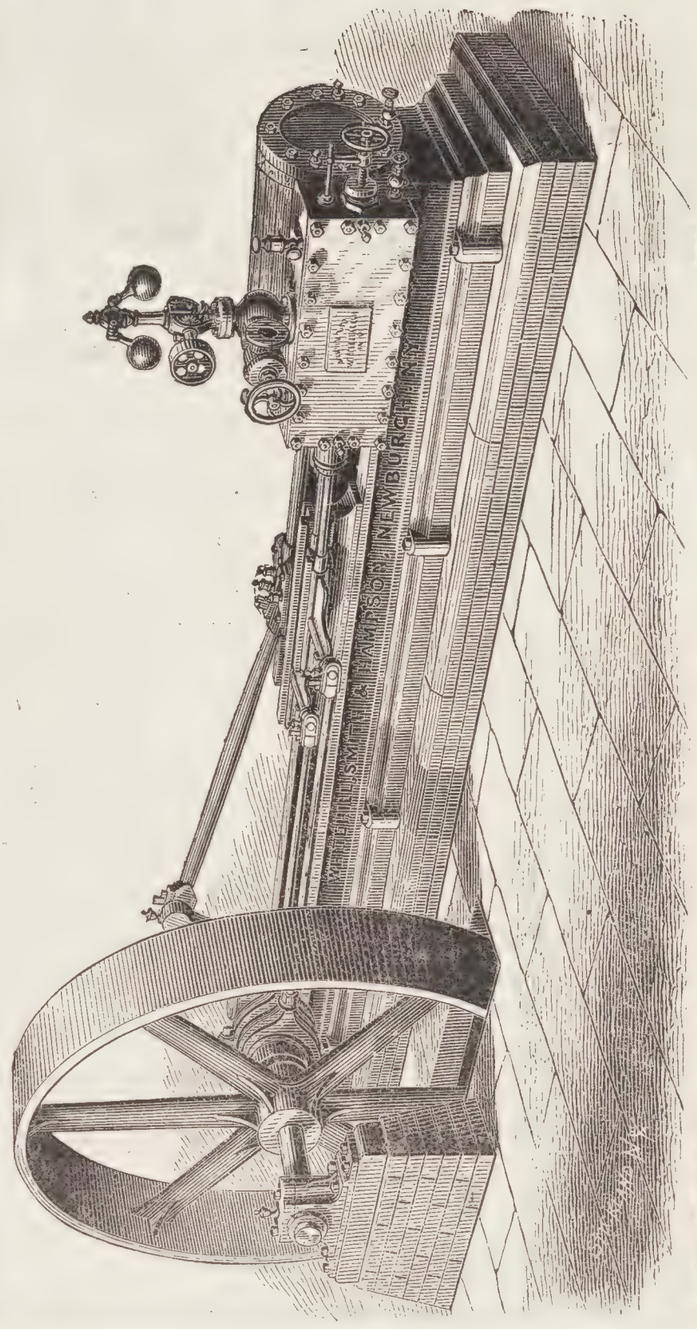

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Vol. V. / *No. 5.* — MAY, 1874. — *One Dollar per Annum.* / *Single Copies, 10 Cents.*

The Penalty of Over-Work.

THE *U. S. Railroad and Mining Register* comments as follows upon the recent death of Colonel William Phillips, President of the Allegheny Valley Railroad Company, and a leading iron manufacturer of Pittsburg:

"Colonel Phillips's career was not that of an ordinary railway engineer. He was one of the few who could represent half a State, and could be the presiding genius of half a dozen great enterprises. He had been overworked and ill about two months, and his friends had arranged to withdraw him for a while from his absorbing and uninterrupted business; suddenly his life left him. The flame flickered and went out. The brain machine was worn threadbare. The bank account of life had been drained to the last cent. Will our railway officials not take warning? It is simple suicide. Giants can endure but so much. The toughest and most elastic bow will break unless relaxed when not in use. Amusement is as needful for man as duty. Every faculty must be exercised by turns, and equally, if life is to be long and happy. Let the books of life be balanced frequently by *deposits* equaling the checks drawn against them. Companies can not be served best by over-taxed brains. Americans live too fast; think too exclusively one set or kind of thoughts; strain and wear out that part of the brain which carries on the work of conscientiousness; *it* fails, while the reasoning part of the brain continues perfectly sound. Why do railway men when subjected to incessant onerous responsibilities go to sleep while you are talking to them? Because they never really go to sleep at any time. Real sleep is *deep* sleep, profound sleep, happy, irresponsible, undreaming sleep. This kind of sleep can only be got by shaking off all business responsibilities, exercising in some favorite way, riding recklessly some joyous intellectual hobby-horse, taking excursions *not* in company with railway men, but alone or with utter strangers, and *not* to see other railway concerns, but to avoid them. *Such* sleep reproduces the brain matter and renews the nervous centres of active existence."

An Architectural Infliction.

A FEW years ago the monotonous style of roof used in architecture was agreeably varied by the introduction of what is known as the Mansard roof, sometimes called the French attic. The splendid architectural piles in Paris received some of their best graces of expression from the handsome sky-lines the Mansard roof gave them, and almost every American traveling abroad wondered why so graceful a roof could not be adopted in our American cities, where the large buildings usually terminated with an abrupt, sharp, and unpicturesque sky-line. The Mansard roof after a time was introduced, and its peculiar beauty soon made it very popular. But, like all fashions which become the rage, and which are adopted by people imitatively, without perception of the principle that governs them, the French attic has become with us an architectural infliction. The Mansard roof was designed for tall buildings. Its special purpose is to break the monotony of a massive pile, and to reduce in appearance its real height. A structure that would seem awkwardly tall, with an unvaried succession of stories, has not only, by means of the Mansard roof, a more graceful caption, but attains more agreeable proportions. The specific purpose of this roof being recognized, the absurdity of its use in small buildings becomes at once apparent. Our builders, however, seem to lack all power of perception, and to have reduced the art of architecture to indiscriminate imitations. Everywhere now the Mansard roof confronts us. Every new cottage on the roadside, new cheap villas in those extemporized villages that line our metropolitan railways, new public buildings of every sort and degree, railroad station-houses all over the country—every thing of the kind now, no matter if only a story high, must have its Mansard roof, with entire disregard of fitness or propriety. It is exasperating to see a good idea thus dragged into absurd and ignoble uses. As we at first hailed with pleasure the appearance of the Mansard roof, we shall now look with hope for the signs that will indicate the termination of its career. And yet whatever may follow will have to undergo the same experience. It is our natural way to try and appropriate every big thing for every little purpose.—*American Builder.*

A New Material for Case-Hardening.

THERE are two materials in common use for case-hardening—charred animal matter and prussiate of potash—both of which are, to a certain extent objectionable. The only methods in use for applying prussiate of potash produce such an extremely thin scale of steel that the process is useless for articles that are to be exposed to much wear; and the preparation of animal charcoal is exceedingly offensive to most persons, and affects not only the individual who prepares it, but the whole neighborhood, which is generally filled with an almost unendurable stench. Since, however, it is only by the use of animal charcoal, such as charred leather, that we can obtain those results that make case-hardening really one of the most valuable operations in the arts, any process by which we can easily obtain either the charcoal itself or an equally efficient substitute must be of importance. Some years ago, we were placed in a position where the preparation of animal charcoal by the ordinary methods was inadmissible, while, at the same time, we were very anxious to case-harden some articles to a greater depth than is possible by means of prussiate of potash as ordinarily used. In this dilemma we had recourse to the following expedient, which succeeded admirably: Having prepared a strong solution of the prussiate, we boiled in it as much coarsely-powdered wood charcoal as could be mixed with it without destroying its fluidity. The superfluous liquid was then drained off, the charcoal spread on a board, and dried by exposure to the air. It was afterward roasted at a temperature just below that of ignition, the object being to drive off all moisture but not to decompose the prussiate, which, at a red heat, is converted into cyanide of potassium and some other compounds. The charcoal thus prepared, and afterward reduced to a moderately fine powder, was found to answer quite as well as animal charcoal.

No difficulty was found in case-hardening to a depth which would allow of a good deal of polishing before the soft metal underneath was reached.

Of late years, the process of case-hardening does not appear to have received the attention that it deserves. This may, perhaps, be owing to the more general introduction of steel; though it is certain that, so long as iron is used at all, the art of case-hardening is capable of producing most valuable results. Where extreme hardness is required to a moderate depth, as in cases where it is desired to avoid friction, to prevent scratching, or to increase the capability of any articles for receiving a high polish, case-hardening is just the thing; and when the process is thoroughly understood, and a few simple tools provided, it is easily and cheaply performed.—*Industrial Monthly.*

The Vacuum Car-Brake.

THE vacuum car-brake consists of a brass globe or bulb about fourteen inches long and five inches in sectional diameter in the largest part, and in shape very much like a lamp globe. The neck of the globe is about eight inches long. The enlargement is made to allow steam to surround a smaller pipe, which conducts the exhausted air. This part of the air-pipe is about six inches long and two in diameter, reaching nearly to the neck of the bulb, leaving a space all around about one eighth of an inch wide; this tube is fitted tightly into the bottom of the globe so that none of the steam may escape below. To the lower part of this globe the air-pipe is nicely fitted. In an enlargement of the end of this pipe, there is an air valve arranged to prevent the refilling of the vacuum, and just below this is a relief valve to allow the air to enter. These valves are conical, so that the greater the pressure the more tightly they fit. Beneath each car, and connected with this apparatus by tubes, made so as not to collapse, is a cylinder with solid ends and flexible sides, which are kept from entirely collapsing by iron rings. The ends of this cylinder are connected with the brakes, so that, when the atmospheric pressure forces the ends together, the brakes are put on. The steam, being introduced from the boiler, passes out around the end of the air tube and removes the atmospheric pressure, producing a vacuum. By enlarging the cylinders beneath the cars, the power may be increased at pleasure, and necessitating, of course, a corresponding increase in the capacity of the ejector to produce the vacuum.—*Exchange.*

The Cost of Railroad Freight Traffic.

MR. O. CHANUTE, a member of the American Society of Civil Engineers, read a paper at a recent meeting of the society on the subject of railroad freight traffic, from which we copy the following table, showing the comparative freight earnings and expenses of seven roads, and the estimated cost per ton per mile of the freight transportation upon each. This latter varies, as will be seen, from .704 to 3.635 cents.

ANALYSIS OF THE COST OF TRANSPORTING FREIGHT ON VARIOUS RAILROADS FOR THE YEAR ENDING SEPTEMBER 30, 1872.

	New-York Central.	Erie.	Lake Shore and Michigan Southern.	Syracuse, Binghamton, and New-York.	New-York and Harlem.	Rensselaer and Saratoga.	Rome, Watertown, & Ogdensburg.
Total freight earnings	$17,258,768.20	$14,737,251.50	$12,030,409.00	$556,091.03	$1,560,376.80	$1,013,853.09	$702,769.67
Total freight expenses	10,648,937.14	9,859,207.80	8,397,736.73	265,172.64	764,844.10	679,228.07	592,895.56
Total miles operated	1,310.2	1,200.5	1,198	81	168.77	181	222
Average through tons	779,201	791,927	740,278	464,689	125,405	162,717	101,134
Average distance carried	232.34	170.86	209.10	70.57	55.73	52.88	66.73
COST PER TON PER MILE.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.	Cents.
Roadway	0.107	0.099	0.113	0.172	0.614	0.334	0.408
General expenses	0.023	0.039	0.028	0.008	0.126	0.109	0.125
Station service	0.136	0.187	0.158	0.062	0.624	0.320	0.365
Track repairs	0.231	0.191	0.204	0.190	0.687	0.635	0.576
Car service	0.137	0.145	0.130	0.058	0.371	0.158	0.364
Train service	0.397	0.353	0.303	0.203	1.180	0.735	0.768
Insurance	0.012	0.023	0.011	0 011	0.033	0.015	0.025
Totals	1.043	1.037	0.947	0.704	3.635	2.306	2.641
Total ton miles	1,020,908,885	950,708,902	886,853,169	37,639,618	21,039,166	29,451,790	22,451,836

These extremes of variation are exhibited in the Syracuse, Binghamton, and New-York, and the New-York and Harlem roads. Other tables in the paper read, show that certain of the expenses of these two roads, *per mile operated,* substantially agree. These are roadway charges, track repairs, and insurance; yet they impose very unlike burdens *per ton per mile.* The general expenses of the first-named road, per mile operated, are only a quarter as much as those of the New-York and Harlem, and less than one fifteenth as much per ton per mile. The station service is less than one half as much per mile, and imposes a burden only one tenth as great. The car service and train service are only about one half as much per mile, and become a charge of only about one sixth as much per ton per mile, so that those expenditures which are specifically the same on these two roads, not only differ greatly in the result per ton per mile, but those expenses which are variable are much greater in the one case than in the other. The explanation is, not only that the one has a larger and the other a smaller relative traffic, but that the former road does a through and the latter a local business; and that the first mainly transports coal and the second merchandise.

Another important cause of difference of cost of transportation between different lines is, in the fact that the cost of loading and unloading, checking and billing goods, is independent of the number of continuous miles of transport, and also that this arbitrary charge varies greatly upon different roads, owing to the nature of their business, and the proportion of freight which requires handling.

The paper of Mr. Chanute contains a lengthy analysis of the elements of cost, and the variations upon different roads, and upon the same road from month to month, and year to year, showing a variation of 30 or 40 per cent between different months; and that in some cases the whole of the traffic is worked at a loss during some portions of the winter. He concludes, therefore, that there is no term of comparison more fallacious, to apply to individual cases or particular shipments, than the average cost per ton per mile. This cost varies with the class of goods which requires more or less handling, and it varies even on the same goods, between the same stations, if empty cars are required to be hauled in one direction or the other. The transportation proper, including car service, is but about one half of the whole expense, and even this varies with the cost of wages and of fuel. Railroad managers, therefore, in fixing rates to be charged, must estimate and weigh, as well as they can, the average cost of a great many different operations and contingencies, and make many attempts before they can ascertain the exact rates which will give the most profitable volume of trade, and the best returns upon the investment.

It would seem to follow, therefore, that the claim which is sometimes made, that charges for short distances shall be in proportion to those for long distances, is not founded in justice, and that tariffs can not be made uniform, either upon different roads, nor for like distances on the main stem and branches of the same road, under dissimilar circumstances of traffic. Neither can the rates be made permanent as to time; for although, doubtless, they should be changed far less frequently than they are, the cost is dependent upon so many varying elements, that a fair rate one year may be either insufficient or extortionate the next.

Even the claim, much better founded, that a higher rate shall not be charged for an intermediate than for a through distance, may be unjust in practice; the extra handling required, the furnishing of empty cars, or the time lost by demurrage, may make the cost greater for the short than for the long distance. It should be stated, however, that it is believed to be good economy, as well as sound policy, not to make a higher charge from an intermediate than from a terminal station, and that the most ample notice should be given of proposed changes in the tariff, which should be uniform in its application. The cost in the majority of cases is no greater, and the ill feeling which is sure to be engendered by the contrary practice more than offsets any resulting profits.

It follows, also, that until experience and discussion shall enable us to understand the subject better, the making of a freight tariff is, and must be to a great extent, a tentative and experimental process, which can not as yet be governed by any fixed mathematical rules. When, therefore, a freight tariff has been adopted upon a road, no matter upon what theory of the probable cost it has been based, it is straightway found necessary to modify it, either in part or by giving special rates, in order to conform with the particular circumstances of the case. As various communities prosper or retrograde, as certain articles increase or diminish in supply or in demand, changes have to be made in the rates in order to adjust them to the new relative importance or cost of the business.

To one unacquainted with the subject, these changes in the tariff seem, and some in fact are, arbitrary and unjust. It is perhaps from this very process of adjusting rates to cover a variable cost, which it must be admitted has not always been wisely or honestly done, that the great dissatisfaction at present existing with the railroads in the West originated—a dissatisfaction which has led to legislation likely to be as tentative and experimental as the tariffs which it seeks to control. In spite of this legislation, the result of this analysis of the cost upon the New-York roads renders it not improbable that the tendency will be in the future toward even greater diversity in charges than now exists upon roads in different parts of the West. Some of them are not now earning enough to meet their operating expenses, to say nothing of future renewals or returns upon the investment, and if they are ever to become profitable, they will be led to raise their freight rates if they can. This, however, does not wholly depend on the will of the managers. It is regulated by competition, and by the charges which the goods to be moved can afford to pay; so that the result of advancing the rates, upon many roads which have been built, would be to drive away or destroy the small amount of business which they now enjoy.

A country is enabled to sustain a railroad pretty much in the ratio of the tonnage of its annual exportable products, and this determines, therefore, the distance apart at which it is most profitable to build them. This, in an agricultural section, varies with the crops which experiment shows it most profitable to raise. Thus in the cotton States, a single railway car carries off the product of 44 acres, assuming an average of half a bale per acre, and the roads are built about 60 miles apart. In Illinois, the proximity of the lakes makes it profitable to ship corn, which only requires the product of 7½ acres, at 50 bushels to the acre, to load a car, and the roads have been about 20 miles apart. In a region growing wheat, a car would carry off the annual product of 22 acres at 15 bushels to the acre, while in a pastoral country, it would require the product of 40 acres in cattle, or of 50 acres in hogs to furnish a single car-load. As population proceeds westward, therefore, and engages in the raising of those products of greater concentrated value, in proportion to their bulk, which alone will bear the cost of transportation to a distant market, it must expect in the long run to submit to higher rates of rail transportation in the proportion of the diminished tonnage it will be enabled to furnish.

The same effect is produced by the building of more roads than are required to do the business of a portion of the country, under the mistaken belief that competition cheapens rates under all circumstances. The new roads, if in excess of the demand, while unprofitable themselves, will raise the cost upon the older lines, by diminishing their tonnage, and the consequent base upon which their fixed charges are to be apportioned. It is quite possible, therefore, that the recent extensive building of new roads in the West, while greatly adding to the convenience of the public, and cheapening transportation from the farm to the nearest railroad station, may yet result in an increase of freight charges, whenever the class of goods to be conveyed will bear any additional burden.

Railway Cars in India.

THE first-class carriages on the East-Indian railways are divided into two compartments, the lavatories being in the centre. On what may be called the ground floor of each compartment there are three comfortable sofas in leather work, the backs of which are made to be pulled out and raised, giving three more berths on what may be called the first floor, or second tier. There is a double roof to intercept the heat; over the windows there is a projecting hood or veranda for the sake of shade, and each window, in addition to its clouded glass sash, has a latticed sash of woodwork. In the hot weather, an additional contribution toward coolness is found in Mr. Sanders's patent, whereby the matting under the perforated false floor, and through which the air has to rise from below, is kept constantly irrigated from a cistern in the roof. But at this season there is no requirement for a patent cooling apparatus; on the contrary, although the sun heat in the daytime is strong, it is not oppressive, and at night the temperature becomes so low that in a railway journey the traveler without rugs and wraps would find it bitterly cold. The family carriages on the East-Indian railroads are saloon-shaped, with a table in the centre, a bath-room at one end, and at the other a narrow com-

partment for servants, whence the punkah, so indispensable to comfort in hot weather, may be worked. The first-class carriages are almost invariably occupied only by Europeans. The second-class vehicles, which are airy and comfortable, are also chiefly used by European civilians and soldiers; and the third-class are almost wholly given over to the natives, who seldom sit on the seats, but use them as a species of perch. In the third-class carriages set apart for women, there is a rare show of dusky but not always uncomely faces, bright eyes, nose-rings sparkling with stones, which, if they are not quite real gems, look nearly as well; massive ear-rings, which not only droop from the lobe, but encrust the cartilage; great silver bracelets, and bangles which chink with every movement of the ankles, which they are held to adorn.—*Ex.*

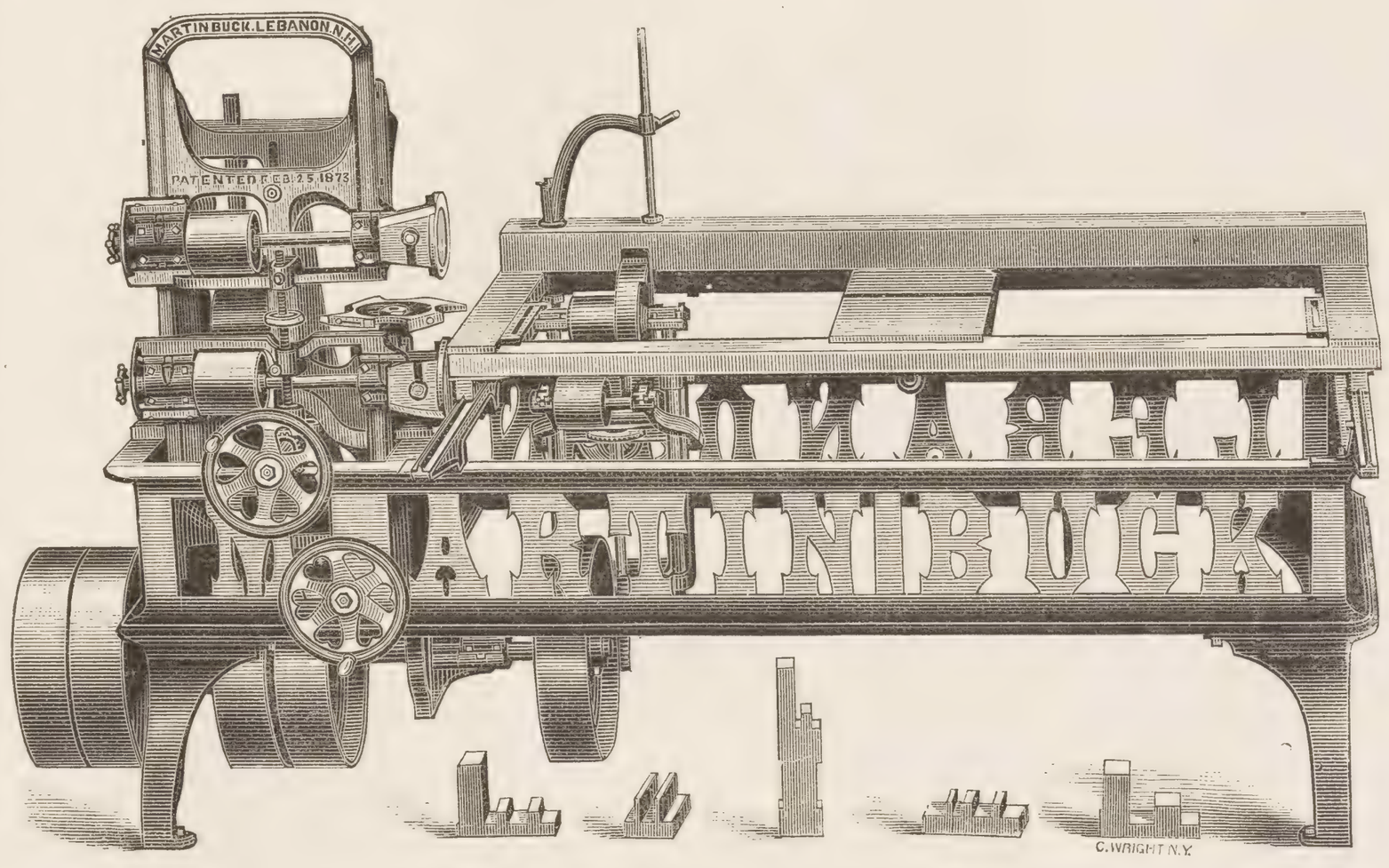
A Novel Street Railway.

A MERCHANT in Chicago has recently patented a device for a street railway dependent upon gravity for the motive power. The railway itself consists of a series of inclined tracks, elevated upon a framework of heavy pillars and trestles, upon which the wheels will carry the car travel. The central posts are heavy timbers, twelve inches square, into which are set the cross joists which support the double tracks on each side. The inner track is set one foot from the post, and the outer is eighteen inches from the inner. The tracks are set on beds, two by fourteen inches, and are braced to the trestle-work and to each other. The cars do not run on the tracks, but a set of four wheels with grooved edges travel on the half-round rails, and the car is suspended from the axles of these wheels by wire rope. On starting at the highest point of the first section of track, the car is hung about one foot clear of the ground, and as the sections are one mile long or more, and the grade is about twenty-five feet to the mile, it is evident that the car would strike the ground within a very short distance. To obviate this, a large wheel, five feet in diameter, is placed at the front end of the car, on the side. This wheel is turned by spokes, like a ship's wheel, and the bold pilot of the car occupies a little platform where he can keep a look-out for passengers and work the machine. As the wheel descends the incline, the operator winds up the car a distance corresponding to the vertical fall, by means of his large wheel and a series of pinion-wheels which turn the shaft to which the supporting rope is attached. The car is thus kept constantly at the same distance from the ground at which it started, and the exertion necessary is not great, owing to the lightness of the car and the leverage obtained by the gearing. Each car carries ten persons, for each of whom a seat is provided with a sliding door for each seat, and when they are filled no more passengers can be carried. The cars weigh about 500 pounds each, and cost from $75 to $100. It is thought that the road will not cost over $2000 per mile.

THE Atlantic Car Company, of Salem, Mass., has appointed a committee to sell its property, pay its debts, and finally wind up its affairs. The property is to be sold under the supervision of a committee of the creditors.

Improved Tenoning-Machine.

UNTIL quite recently, manufacturers have felt the want of a machine for cutting tenons, in which the cutter-heads, aside from their individual motion, can be so connected together that when the cylinders are adjusted to the required thickness of the tenon, both heads can be moved at once, and arranged at a suitable height from the carriage to give the desired depth of shoulder without changing their relative positions. This want has been provided for in Buck's Double and Triple Tenoning-Machine with gaining cylinder combined, the mechanical features of which are apparent from an inspection of the engraving. The cutters are connected with frames which have a free vertical motion, and are coupled together by a right and left hand screw. The screw is operated by a hand-wheel and bevel gear, by means of which the cutter-heads can be arranged in any desired position, either relative or together, according to the required thickness of the tenon shoulder. A horizontal motion of the heads is also provided for, in cases where one shoulder of a tenon is made deeper than the other. To make double or triple tenons, after the patterns shown in the engraving, a horizontal cutter-head is worked on a vertical shaft and regulated by the lower hand-wheel. It may be placed in any desired position, vertically, or dispensed with altogether while making single tenons. The gaining cylinder may be moved up or down, or placed entirely out of the way, so the carriage will pass over it while making single or double tenons.



BUCK'S DOUBLE AND TRIPLE TENONING-MACHINE.

The timber is placed on the carriage and passed between the cylinders, and as it emerges, cut in one thick tenon, or in the outlines of two or more, it comes in contact with the cutter on the vertical shaft, which makes its way through the thick tenon, cutting out a space and completing the double tenon. Gains are cut from the under side of the timber as it passes over the cylinder, ranging from one sixteenth to two inches in depth, and by forming several cuts, of any length. It is admitted by most practical mechanics, that in making tenons, cutters which make lateral cuts require only about one fourth the power necessary to drive those making semi-longitudinal cuts; and as about two thirds of the work of this machine is lateral cutting, a corresponding saving is effected by its use, to say nothing of the time and wear saved in sharpening. The machine is 8½ feet long by 4 feet wide, weighs 2500 pounds, and can be operated upon the largest and longest timber used in the construction of railroad cars. It is in use in numerous car-shops, including those of Osgood Bradley, Worcester, Mass.; the Wason Company, Springfield, Mass.; the Jacksonville Car-Works, Jacksonville, Ill.; the Litchfield Car Co., Litchfield, Ill.; the Lebanon Manufacturing Co., Lebanon, Pa., and the Harrisburg Car-Works, Harrisburg, Pa. In each of these establishments it has given the most unqualified satisfaction, and elicited the most flattering testimonials in its behalf.

For more particular details pertaining to its operation and mechanical construction, the reader will address the manufacturer and patentee, Mr. Martin Buck, Lebanon, N. H.

The Whims of Machinery.

THERE are, says the *Scientific American*, some curiosities about machines which seem unaccountable. Every user of a sewing-machine knows that from some unknown reason the machine which yesterday performed its work so well, so almost enthusiastically, to-day refuses to do more than half its task, and does that half in a surly, indifferent manner. So with many other machines. Even the steam-engine is subject to these fits. Is there some occult bond of sympathy between the operator and his machine, by which the latter is influenced by the mental condition of the former? for it is certain that these differences can not be atmospheric or other external influences. This matter is quite humorously and truthfully treated in the subjoined extract:

"It is perfectly well known to experienced engineers that if a dozen different locomotive engines were made at the same time, of the same power, for the same purpose, of like materials, in the same factory, each of those locomotive engines would come out with its own peculiar whims and ways, only ascertainable by experience. One engine will take a great meal of coal and water at once; another will not hear to such a thing, but will insist on being coaxed by spadefuls and bucketfuls. One is disposed to start off when required at the top of his speed; another must have a little time to warm at his work and to get well into it. These peculiarities are so accurately mastered by skillful drivers that only particular men can persuade engines to do their best. It would seem as if some of these 'excellent monsters' declared, on being brought out of the stable, 'If it's Smith who is to drive, I won't go. If it's my friend Stokes, I am agreeable to any thing!'

"All locomotive engines are low-spirited in damp and foggy weather. They have a great satisfaction in their work when the air is crisp and frosty. At such a time, they are very cheerful and brisk, but they strongly object to haze and mists. These are points of character on which they are united. It is in their peculiarities and varieties of character that they are most remarkable.

"The railway company who should consign all their locomotives to one uniform standard of treatment without any allowance for varying shades of character and opinion would soon fall as much behindhand in the world as those great governments are, and ever will be, who pursue the same course with the finer piece of work called man."

THE gross earnings of 24 railroads, mostly Western ones, for the month of March, show a decrease of $839,044, as compared with their earnings for the same period last year.

Why do Rails Wear Out?

BY JAMES M. BLANCHARD.

THE importance of this question is conceded by every one who is in any way interested in the operation of railroads; and in endeavoring to set forth the cause of the failure of so many of the rails upon our roads, it will be proper to state in the first place what is *not* the cause of such failure, and then we shall endeavor to ascertain what *is* the cause.

First, then, their failure is not to any considerable degree owing to the action of the atmosphere or to corrosion; neither is it owing to extremes of temperature, or to the expansion or contraction caused thereby. It is not caused by the vibrations to which they are subjected by passing trains, as such vibrations, whatever other effect they may have, do not cause any appreciable wear; neither is it caused by the rolling of the wheels over their surfaces—when considered as an independent proposition and irrespective of conditions—for if such rails are well laid, of the proper form, and well manufactured of good material, a car weighing ten tons and loaded to its full capacity, or an engine of the usual weight, might run over them once in fifteen minutes for a hundred years without wearing them out, provided the rate of speed was slow enough. This statement is fully sustained by the experience of the Grand Trunk Railway, as given in a recent report of its president; and this same experience also demonstrates that the oscillation of cars does not wear the rails.

What, then, does cause them to wear out? I answer that, as a rule, they do not properly wear out, but are pounded out, the pounding causing lamination, the lamina being observable along the line of any road by looking at the sides of the rails. The cause of lamination becomes then an inquiry of great importance; and in treating the question negatively, it is proper to say that lamination is not produced, as already intimated by the mere passing of cars and engines of the usual weight over the rails, irrespective of other conditions. It is nevertheless true that, as railroads are at present operated, the weight and the wheels both become elements of destruction to the rails, but this only occurs to any injurious extent when the rate of speed at which they are propelled is taken into the account. To enable us to appreciate the full force of this fact, let us suppose that a car of the usual weight and with a full load is placed upon the rails and there allowed to stand for an indefinite time. Will any one contend that the rails under it will be laminated, or, as it is usually misnamed, "worn out"? Certainly not. Now let us suppose that a man is hired to push this car from one end to the other of these rails, their length being such that he can do so every ten minutes. Is it probable that any one man or fifty men would in their natural lifetime be able to wear out these rails in that way? Now let us suppose that a portion of the load of this car is removed, and machinery of equal weight with the removed portion placed in it, such machinery being capable of moving the car at the rate of, say twenty-five miles an hour, and it will be found that lamination of the rails at once commences. Why should such an effect be produced? I answer because of the pounding effect of the wheels upon the rails, consequent upon the increased rate of speed at which they are moved. It will follow as a matter of course that this effect will be most noticeable at the ends of the rails, because there is always a short space between them at these points, and their upper surfaces can not always be kept on the same level, and hence the blow will be more severe at these points than at others. It is a fact demonstrated by actual experiment, that on a road in ordinary condition and at a rate of speed of about thirty miles per hour, the wheels of loaded cars would in passing from one rail to another jump two inches, or in other words, would not touch the rails on to which they were passing within two inches of their ends; and it is easy to conceive how, under such circumstances, the lamination of the rails at the ends can occur. But this laminating effect does not cease at the time and place where the wheels first touch the track, for it should be borne in mind that the entire weight of the load, with the exception of the wheels, rests upon springs which vibrate after the wheels touch the rails after their leap, and such vibratory action, at the rate of speed named, is continued throughout the length of the rail, until it is again intensified by passing another joint; and so the pounding or laminating effect is kept up throughout the entire line, or at least so long as the rate of speed is maintained.

Another fact which should be kept in mind is, that the pounding or laminating effect of a train upon the rails—the weight being a constant amount—is always increased in the ratio of the squares of the velocity at which the trains are run. This being true, it follows that with a given velocity, the weight of the passing train will to a great extent determine its laminating effect, always supposing it to be enough to cause *any* effect of that character. It is not the intention of the writer to assert that there is not any wearing effect produced upon the rails by other causes than those named, such for instance as the sloping of the wheels of the engines and cars, but only to assert that the principal difficulty in this respect arises from the two causes above alluded to, namely, an excess of weight and too great a rate of speed.

It will not, I think, be disputed that most of the opposition with which the railroad companies are at present confronted, arises from the fact that the people, and especially the "Grangers," believe that the prices charged for the transportation of freight are exorbitant. That this view of the case is the correct one, I do not admit, so long as the present high rates of speed at which such freight is moved are insisted upon, and so long as it has to be carried in the unnecessarily heavy cars now in use. The other side of this question must be regarded in treating the subject dispassionately, and the views of the railroad companies respected. Their answer to the demand for "cheap transportation" is, that the present prices are not above the remunerative point; and that when all the expenses which grow out of building, equipping, maintaining, and operating their lines are charged up to the proper account, there is not left more than a reasonable percentage upon their investments; and this can not be regarded as otherwise than a truthful statement, at least in a great majority of cases. In thus responding to the demand made upon them, do not the companies overlook one important fact? I shall venture to say that they do, as they seem to forget that the competition which has grown up between rival companies as to the time in which freight and passengers shall be delivered, or rather the rate of speed at which the trains carrying them shall be run, is a matter for which they alone are responsible, and that such rivalry has been the cause of a large proportion of the expense at which trains are now run. These ruinously high rates of speed having been established by the railroad companies, it seems but natural that shippers should insist upon their being kept up; and in complying with this wish, the companies have incurred and are still incurring these unnecessary expenditures; for it is a fact that, with the heavy rolling-stock now in use, a reduction of the speed at which it is moved would largely reduce the expenses. If the statements herein made and the conclusions reached are correct, there would seem to be within the reach of our railroad managers a remedy for the evils complained of; and although a portion of such remedy is not of easy application, because of the fact that it would require the remodeling or renewal of the rolling-stock of their roads, in order to prepare them for carrying the greatest possible load with the least possible dead weight, yet it is possible to apply the other part of the remedy, and thus enable themselves to carry freight at a less cost to the shippers and at a greater profit to themselves—this last-named portion of the remedy being a reduction of the speed of freight trains to such an extent as to deprive them of their pounding or laminating effect upon the rails. Another saving which would grow out of this reduction of speed, would be the wear and other damage done to the cars themselves, which would not be inconsiderable.

Many of the evils complained of by the farmers, instead of being attributable to railroads, are more justly chargeable to the avarice of shippers, who seek to make the roads the scapegoats for their own misdoings. It may, however, be asked why the railroad companies do not associate themselves together for the purpose of reducing the rates of speed at which they will run their trains, as well as for other purposes. I am aware that circumstances frequently arise which seem to render it very difficult to maintain a uniform rate of speed for freight trains; such as delays caused by waiting for passenger trains and for other freight trains, and that when such delays do occur, the engineers of such trains always feel at liberty to "make up time," by running at a rate of speed greater than that allowed by the rules of the company; and hence it may be asked, are there no other means of preventing the lamination of rails except by a radical reduction of speed, or of speed and weight? To this it may be answered there are, but that they are not of easy application upon roads now in operation. The remedy alluded to would seem to consist in making the rails of some kind of material less liable to lamination than iron—steel being the most available for such purposes. It would seem to be a fact that, in selecting material for rails, great importance should be attached to their ability to resist the cause of destruction herein named, and that when this has been done, the next important step is to select for the tires of engine and car-wheels a material, the density of which is as nearly as possible the same as that of the rails. This done, and the "dead weight" of the train reduced to its minimum, with a proper reduction of speed, and there does not appear to be any reason why the rails of our roads should not last upon an average fifty years, or why the cost of transportation can not be considerably reduced without detriment to the railroad companies. The corresponding density of the metals of which rails, tires, and wheels are made, I regard as a point of vital importance, and deserving the careful consideration of all who are desirous of introducing more practical economy in the operation of railroads.

Railroad Employees.

No class of American workingmen have more perfectly defined peculiarities than those engaged upon railroads. Exposure to hardships and dangers; exactness as to time and the performance of duties; intimate association among themselves, and comparative exclusion from intercourse with others—all combine to render them a marked class, noted for their courage, industry, and attachment to their "guild." Growing with the increase of railroads and railroad business, they have become a body numbered by thousands in all our large cities, and their influence is felt in every community. Generally intelligent—often above the average in ability—they are well capable of taking care of themselves in the present as well as in the future.

It is somewhat puzzling to understand why this class of men do not make a combined effort to provide for themselves and their families in case of accident or death. From the nature of their employment they are thoroughly organized, and therefore the most difficult part of a "mutual benefit" movement is accomplished. They are paid at stated intervals, and the small contribution needed from each for a common fund, could not only be readily spared, but easily collected.

In view of these facts and premises, would it not be well to start, on some of the larger roads, a Mutual Benefit Association of Railroad Employees? Such an association might combine the principles of both life and accident insurance. It could be organized on the

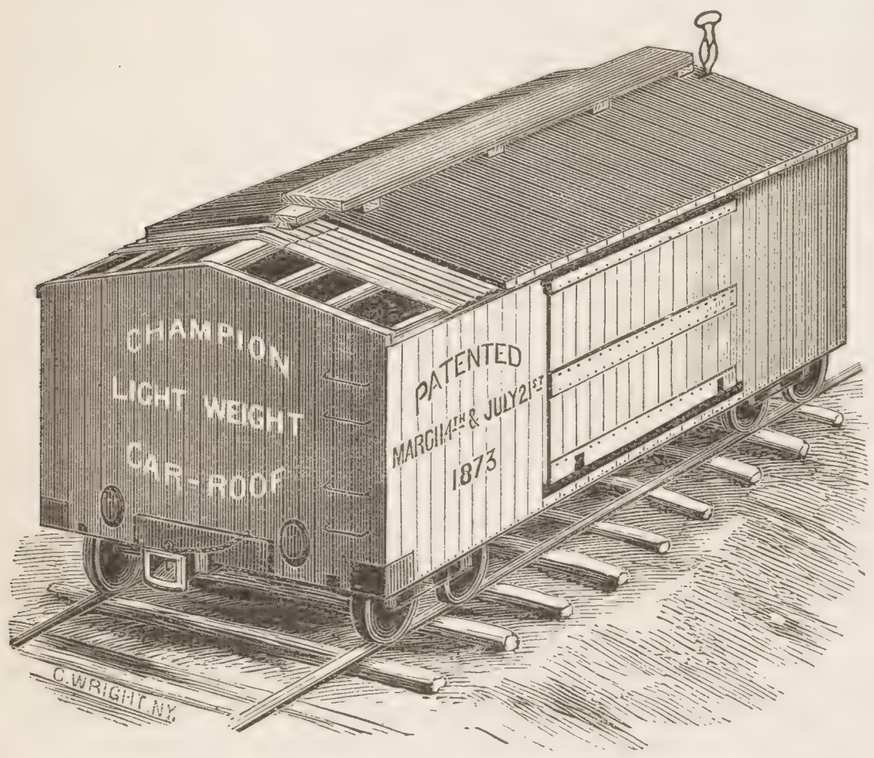
simplest basis, and carried out effectually and economically. Every railroad officer would encourage it; and, once started, almost every employee would co-operate with it. The extent to which the system might be carried need only to be limited by the necessities and requirements to be met. It might be made to care for the sick and suffering; provide homes for the infirm and superannuated; and succor the widows and orphans. Every man can follow the plan in his mind as clearly as it could be elaborated here.

Take, as an instance, a railroad employing ten thousand men in all its various branches of operation, and unite these employees together for mutual benefit. If each man pays ten cents per month, the combined fund will amount to twelve thousand dollars per year. At this low rate the means are secured for doing a vast amount of good; and it is reasonably certain that the humblest employee would be willing to contribute double that amount per month, for a purpose so directly beneficial to himself and those dependent upon him.

A plan similar to this built up the magnificent soldiers' home near Washington, and it has been adopted with like results in many other places. Why not, then, apply it practically to railroads? All it needs is a start somewhere, and, once under way, it will work itself. There is intelligence, enterprise, and skill sufficient to put the machinery in operation on almost any road, and it is to be hoped the movement will be inaugurated without delay.—*Official Guide.*

Corrugated Metallic Roof for Freight-Cars.

IN the construction of freight-cars, the roofing is a matter of paramount importance. Experiments, with a view to more satisfactory results, have been made by car-builders with varying success. Almost every kind of material adapted to the purpose has been tried—double boarding in various ways, and tin and iron on top and underneath the boards. The great difficulty hitherto has been in the natural expansion and contraction of the material, under varying extremes of temperature, and the injurious effects of oscillation and vibration when the car is in motion, making it almost impossible, apparently, to devise a substantial and durable water-proof roof.



The engraving illustrates an improved method of roof construction, briefly referred to in the report of the proceedings of the Car-Builders' Monthly Meeting, contained in our last issue, and of which the Metallic Car Roofing Company, of New-York, are the proprietors. The unfinished end of the car shows the way in which the roofing material is applied. The metal consists of sheets of corrugated zinc or galvanized iron, about three feet in width, laid under the boards and parallel with the slope of the roof, and of sufficient length to lap each other at the apex. The roof-boards are tongued and grooved like ordinary flooring, and fastened at the top by a T-shaped clamp which is bolted to the centre purlin, the bolt-heads being covered by the running-board. Their lower ends are fastened to the frieze or barge-board by screws or nails, such fastening being entirely outside of the car. The advantages claimed for this kind of roof are, that in consequence of the sheets of metal being corrugated, and the corrugations fitting snugly into each other where the sheets lap, provision is made for any contingencies of contraction or expansion, or twisting of the car from vibration. The zinc, moreover, is not liable to corrode, and can be utilized for other purposes when the body of the car is worn out, saving one third of the original cost of the metal, besides being considerably lighter than iron. The construction is so simple in its character, that when the material is in readiness for being put on, a car can be roofed in an hour by those who are familiar with the work.

This style roof has, we are informed, been quite extensively introduced upon Southern roads within the past two years, and has given entire satisfaction. Among these we may mention the New-Orleans, Jackson, and Great Northern; Mississippi Central; Nashville, Chattanooga, and St. Louis; Western and Atlantic; South-Carolina Central, Tennessee and Pacific, etc. The proprietors, as above, may be addressed at 433 Broadway, New-York.

Railroading in Early Days.

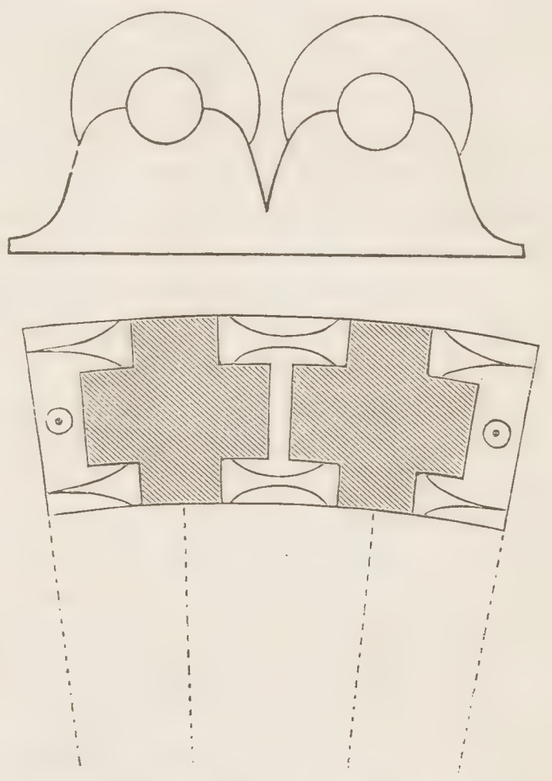
A WRITER in the Hartford *Courant* gives reminiscences of railroading in Connecticut forty years ago. When the Hartford and New-Haven road was first opened, it had very meagre facilities, the road-bed was poor, had only strap-rails, which were all the while curling up and running through the car-floors, and the cars were small and the locomotives weak. In fact, it didn't take much to block a train in those days. Sometimes an inch of snow on the rails would do it. One of the first conductors on the road tells how he and the baggage-master used to sit in front of the locomotive, one on each side, and brush off the snow from the rails with a broom as the train slowly crawled along. Each had a pail of sand, and sprinkled a handful on the rail when necessary. The driving-wheels (engines had only one pair then) used to slip round and round, and torment them almost to death. On one occasion, a train got "stuck" on the Yalesville grade by one inch of snow, and the wood and water gave out before the locomotive could overcome it. At last, they got out the neighbors, yoked four pairs of oxen to the train, and drew it, passengers, baggage, and all, into Meriden with flying colors! In the early days of the road, the stage-coach drivers used to regard the cars with great contempt. Indeed, thirty years ago, the passenger trains were three or four hours on the road to New-Haven, and the stage-coaches went in about the same time. Superintendent Davidson remembers riding in a two-horse carriage in 1840, which had a race with a passenger train near Wallingford, where the turnpike and railroad are parallel for three or four miles, and during all that time the carriage kept even with the train. There were only two trains each way, daily, then, both carrying passengers and freight. The old cars were divided into three compartments, opened on the side, and had 24 seats. The locomotive had only twelve-inch cylinders, and no cabs to protect the engineer and fireman from the weather.

THE examining committee of the affairs of the Pennsylvania Railroad Company have commenced their work, and have proceeded far enough already to discover the folly and uselessness of their appointment.

Mr. C. E. BENTON has been appointed general master-mechanic and car-builder of the Canada Southern, the Chicago and Canada Southern, the Toledo, Canada Southern, and Detroit, and the Michigan Midland Railroads, with headquarters at St. Thomas, Ontario.

Improved Side-Bearing.

THE cuts illustrate an improved side-bearing, to which our attention has been called by a correspondent, who is the inventor. The drawings are on a scale of 2 inches to the foot, and represent a side elevation and horizontal sectional view. The chair or frame in which the rollers are set, forms a segment of the circle described by the truck in curving. The axes of the rollers, as well as the bevel of their circumference, are on a radial line from the centre-pin, and thus secure a natural and easy action. The inventor claims that two rollers equalize the weight on the springs, and prevent the bolster from tipping; and being smaller than those ordinarily used, revolve more, and are less liable to become flattened. There is also a space underneath for air to circulate, which prevents the accumulation of dust and dirt. The purpose of most side-bearings, he thinks, is merely to prevent the rocking of cars from side to side, without any reference to curving. If flat plates are used, there is a constant grinding and wearing; or, if a single roller without a beveled surface corresponding with the radial line from the centre-pin, we have the double motion of slipping and turning, because a wheel made to run on a straight line, can not otherwise be made to curve. It is claimed that rollers constructed as indicated in the cuts, meet all the requirements of a side-bearing, and will prevent the making of what are called "sharp wheels" on roads having numerous curves, by lessening the friction of curving, and also saving the rails. The friction-plates on transoms are beveled to correspond with the bevel of rollers.



Fireless Locomotives.

A COMMITTEE of gentlemen in St. Louis appointed to examine the matter of fireless locomotives on street railways, submit the following comparative figures:

1. Summary of operating expenses per year for street railways with 22 horse-cars and 200 horses:

Feed and grooming 200 horses	$32,850
Depreciation of horses	4,600
Depreciation of cars	3,000
Ordinary repairs of cars	1,000
Repairs of harness, shoeing, medical attendance	4,000
Wages of conductors and drivers	29,200
Repair of street (three mile road)	1,800
Total	$76,450

2. For street railways of the same carrying capacity, operated with the fireless locomotive:

Fuel and attendance for 2 boilers	$14,725
Depreciation on 16 locomotives and 2 boilers	3,800
Depreciation of cars	2,400
Ordinary repairs of cars	800
Ordinary repairs on 16 locomotives	3,000
Wages for drivers and conductors	23,360
Extra wear and tear of rails	2,000
Total	$50,085

Difference in favor of the fireless locomotive for twenty-car railway, $26,395, a saving of 33 per cent.

Pullman Palace-Cars in England.

THE London *Times* of March 23d contains the following remarks upon the introduction of Pullman Palace-Cars on the Midland Railway:

"It has for some time been rumored that the directors of the Midland Railway Company were about to introduce into England the system of 'palace-cars,' which has rendered American traveling, notwithstanding the distances to be accomplished, not only comfortable, but even luxurious. The rumor was fortunately well founded, and although the general public will have to wait a few weeks longer for the privileges about to be accorded to them, the cars are quite ready for use. On Saturday, a train composed of four of them made a trip to Bedford and back, for the purpose of exhibiting the chief peculiarities of the system.

"The new cars were constructed in America, at the works of the Pullman Company, at Detroit, and were sent over piecemeal, to be put together at the Midland Company's works at Derby. They differ from those used on the American lines in being somewhat narrower, a difference rendered necessary by the smaller available space between the up and down lines of rail, as well as between the near rail and the platform; but in all other respects they are like the conveyances with which visitors to the United States are so familiar. Of those used on Saturday two were 'parlor' and two were 'drawing-room and sleeping-cars.' Between these there are many points in common, as well as certain differences."

The *Times* then devotes much space to a minute description of the cars, continuing thus:

"The perfection of the Pullman system, however, does not depend wholly, or even chiefly, upon the cars themselves. The Messrs. Pullman owe much of their success to the extreme care which they have exercised in the selection of their car attendants, in maintenance of the most scrupulous cleanliness, and in providing that every thing comprised under the head of service, from the arrangement of the dinner-tables to the soap and towels in the lavatories, be the very best of its kind. The sleeping-cars in England will be in demand chiefly for long journeys. But few people, and especially few ladies, will hesitate to exchange the confined boxes in which we now travel, with a possibility of unpleasant companions, with a certainty of being covered by blacks and half choked by dust, and with the hurry, crowding, and discomfort of the refreshment bars, for the light, handsome, clean, and well-ventilated rooms, in which there is power to move freely about from place to place, in which there will usually be passengers enough to render the most timid lady entirely comfortable, and in which a trained servant is at call, ready at any time to bring any refreshment that may be asked for, and that the commissariat of the cars will furnish. In America, this commissariat is very complete; in England, it will probably be more limited.

"As regards the question of safe traveling, the Pullman cars have many advantages. The great strength of their flooring, to which we have already referred, would carry them with little injury through collisions or shocks by which English carriages would be smashed to pieces; and, as they are all fitted with the Westinghouse air-brake, they are effectually protected against one of the most common sources of danger. The arrangement of their springs and bogies almost entirely destroys the oscillation with which we are only too familiar, and the cars at the highest speeds run with well-nigh absolute smoothness. The visitors to Bedford on Saturday were asked to write their names on a book, and they did so without the smallest difficulty when the train was running at the rate of fifty miles an hour. It will be quite possible for a busy man to devote much of the time spent on a railway to his correspondence, and the rest, if it so please him, to sleep.

"The cars are to be placed, in the first instance, upon the line from St. Pancras to Liverpool, and as soon as the direct line to Liverpool from Woodley Junction is open for traffic. The directors propose to run the sleeping-cars late at night—say after the London theatres are closed—and to shunt them on to a siding at Liverpool, where the occupants may finish their slumbers undisturbed, and may rise and depart when they are inclined. The arrangement with the Pullman Company is, that they supply cars and attendants, and take the extra charge above first-class fare which will be demanded from those who occupy them. The amount of this charge is not yet settled, but it will probably range from half a crown to half a sovereign, according to length of journey.

"We understand that the public are indebted to Mr. Allport, the well-known manager of the Midland Railway, for the introduction of the cars into this country; but the enterprise of the Pullman Company, now that they have crossed the Atlantic, will not be limited to England. A drawing-room and sleeping-car was dispatched last week to France, and will be exhibited in all the chief cities of the continent."

Two Superb Drawing-Room Coaches.

THE Lake Shore and Michigan Southern Railway Company have just completed, at their shops in Cleveland, Ohio, two drawing-room coaches which surpass in elegant design and finish any railway passenger-coaches that have ever been built in this or any other country. They are named respectively the "Yosemite" and "Yokohama," and were constructed for the Lake Shore and Michigan Southern Sleeping-Car Company. They are mounted on six-wheeled trucks of the most approved pattern, and are equipped with Westinghouse brakes and Miller platforms and couplers. The extreme length from point to point of coupler-hooks, is 77 feet 6 inches, height over all about 11 feet, and 15 feet from track to top of dome. The coach body outside of frame, is 69 feet long and 10 feet wide. The paneling is in the usual style at these shops, and is painted a rich carmine color, relieved with gold and silver gilding and other elaborate and tasteful ornamentation. On each side are 8 elliptic windows, 4 feet 6 inches by 4 feet 6 inches; also 4 smaller semi-circular windows, 4 feet 6 inches in height and 2 feet 4 inches in width, all of polished plate-glass. The dome or elevation has 20 windows on each side, of ornamental cut glass of the finest quality and design.

The two coaches are substantially alike, so that a description of one answers for both. The interior finishing and fitting up are replete with every requirement of luxury, elegance, and comfort. Nothing that the skill of designer, artist, and artisan could contribute, has been omitted. The central and most conspicuous compartment is the large drawing-room, 42 feet in length. The wood-work is Spanish mahogany and rosewood, French polished, and beautifully inlaid with satin and tulip-wood; and the general effect is rendered very striking by the introduction of numerous architectural embellishments in the form of pilasters, Corinthian columns, projecting cornices, beautifully carved pendants, modillions, tracery-work, etc. There are 28 revolving chairs made at the company's shops expressly for this room, and elegantly upholstered in Ponceau and green, with gimp trimming and green and gold cord. The floor is richly carpeted; the windows are curtained with brocatel; green lambrequins festooned with orange silk fringe, gimp trimming, cords, tassels, drops, etc., all made to order for these coaches. The head-linings which form the ceiling are elaborately frescoed from designs by the company's own artist, and specially adapted to their surroundings. The room is lighted by three large bronze chandeliers of four burners each, and made from original and special designs. The entire fitting up is exceedingly rich and attractive, and at the same time harmonious in tone, presenting no discordant and startling contrasts calculated to offend observers with artistic and discriminating tastes.

At one end of the car are a ladies' toilet-room, and a state-room adjoining, both fitted up in the same general style indicated. These are flanked by a side hall in which a Baker heater is placed. There is also between these rooms and the drawing-room, a cross-hall with a large mirror and drinking fountain.

At the other end of the car is a side-hall, two small state-rooms fitted up in the same elaborate style, also a store-room and gentlemen's closet.

The two coaches were built for George B. Gates, Esq., of Buffalo, President of the Sleeping-Car Company, and cost about $50,000. They will run from Cleveland to Rochester, each coach on alternate days, and will constitute a kind of traveling conveyance which the public can not fail to appreciate.

Car-Coupling.

THE committee of the Master Car-Builders' Association on "Best Device to prevent Accidents while Coupling Cars," have issued a circular containing the following questions. Replies should be addressed to the chairman of the committee, F. Childs, Great Western Railway, Hamilton, Ontario.

1. About how many different companies' cars run over your road?
2. How many different styles of draw-bars?
3. What has been your experience as to height of draw-bars, both as to loss of life and damage to rolling stock, in consequence of drawheads overlapping?
4. Do you keep yours to Master Car-Builders' standard of 2 feet 9 inch from top of rail to centre of draw-head?
5. How many accidents have been caused on your road by violent switching during the past year?
6. How many have been injured where there was fair switching?
7. Number injured by getting their feet caught in wing-rail or frog, thrown down and run over?
8. What kind of dead wood would you recommend as being most likely to prevent injury in case of draw-bar breaking or overlapping?
9. Do you think uniformity of draw-bars would be conducive to safety.
10. Have you given any of the self-coupling draw-bars a trial—if so, whose?
11. What was your experience with them generally, and did you find that their use lessened the number of accidents?
12. What description of draught-springs have you in use—if more than one kind, state your experience with each as far as relates to the subject in hand?
13. Please give us your ideas on any other point you consider worthy of note, not mentioned above?

THE Chicago *Tribune* describes as follows a stove for heating cars invented by Mr. John Oliphant, which has been used on the Pittsburgh, Fort Wayne, and Chicago Railway for about two months, and has lately been put on a Chicago and North-western car:

"It is a cylinder in form, about 4 feet high and 2 in diameter. The bottom of it is a tank holding about four gallons of water. In this tank is a valve which keeps shut while the stove keeps its perpendicular; but when it loses that, the valve opens and the water pours out into the stove, completely putting out the fire. About a foot above the tank is the grate, and above it the fire, as in an ordinary stove. Unlike most stoves, the atmosphere in the car is not overheated, air being introduced from the outside in a pipe, which is regulated by two dampers, admitting as much as is required. The stove is incased within a sheet-iron jacket, as it is called, leaving about six inches between the stove and it. Here the fresh air comes in and is heated, and then passes into pipes that run down the sides of the car, with a register under each seat. The warm air thus introduced into the car is pure, and comes in near the floor, keeping the feet warm, and not heating the air in the upper part of the car, as common stoves do."

THE New-York Central and Hudson River Company intends to build in New-York a grain elevator, with a capacity for storing 1,000,000 bushels of wheat. The details of the project have not been fully decided on, but it will probably be built on the North River, about 500 by 200 feet in size.

Recent Patents.

Improved Station Indicator.—Daniel H. Close, New-York City.—An endless belt passes over rollers and is held taut by springs. By suitable construction, when a rod is drawn back, a cam is released from a pawl, and it is caught by another pawl, allowing a spring to revolve one roller one half a revolution. As the rod is released, the pawls move forward and the roller completes its revolution, bringing the name of the next station into view. One end of the cord connecting with the rod is attached to the bell-cord passing from the engine through all the cars of the train. The other end of the cord is attached to a spring roller attached to the rear end of the rear car, and which is designed to take up the slack of the bell-cord as the cars are stopped or backed. When the train is about to leave a station, the engineer pulls the bell-cord toward the engine. This draws the cords and draws back the pawls, allowing the roller to make a half revolution; then, as the bell-cord is released, the rollers complete their revolution, and the name of the next station is displayed.

Improved Combined Car-Starter and Brake.—William T. Beekman, Petersburg, Ill.—This invention, which is designed more especially for application to street cars, has for its object to utilize the force expended in braking the cars, for the purpose of storing power to be subsequently used as an aid to propulsion. To this end a friction-clutch, a chain-pulley, and ratchet mechanism are employed, and a spring, these elements or devices being so combined and attached to the axle, wheel, and draught-bar, that whenever the brake mechanism is brought into action the spring will be compressed correspondingly to the force thus expended or necessary to overcome the momentum of the car and reduce its speed, or bring it to rest. The power thus stored is immediately or remotely available in starting or propelling the car.

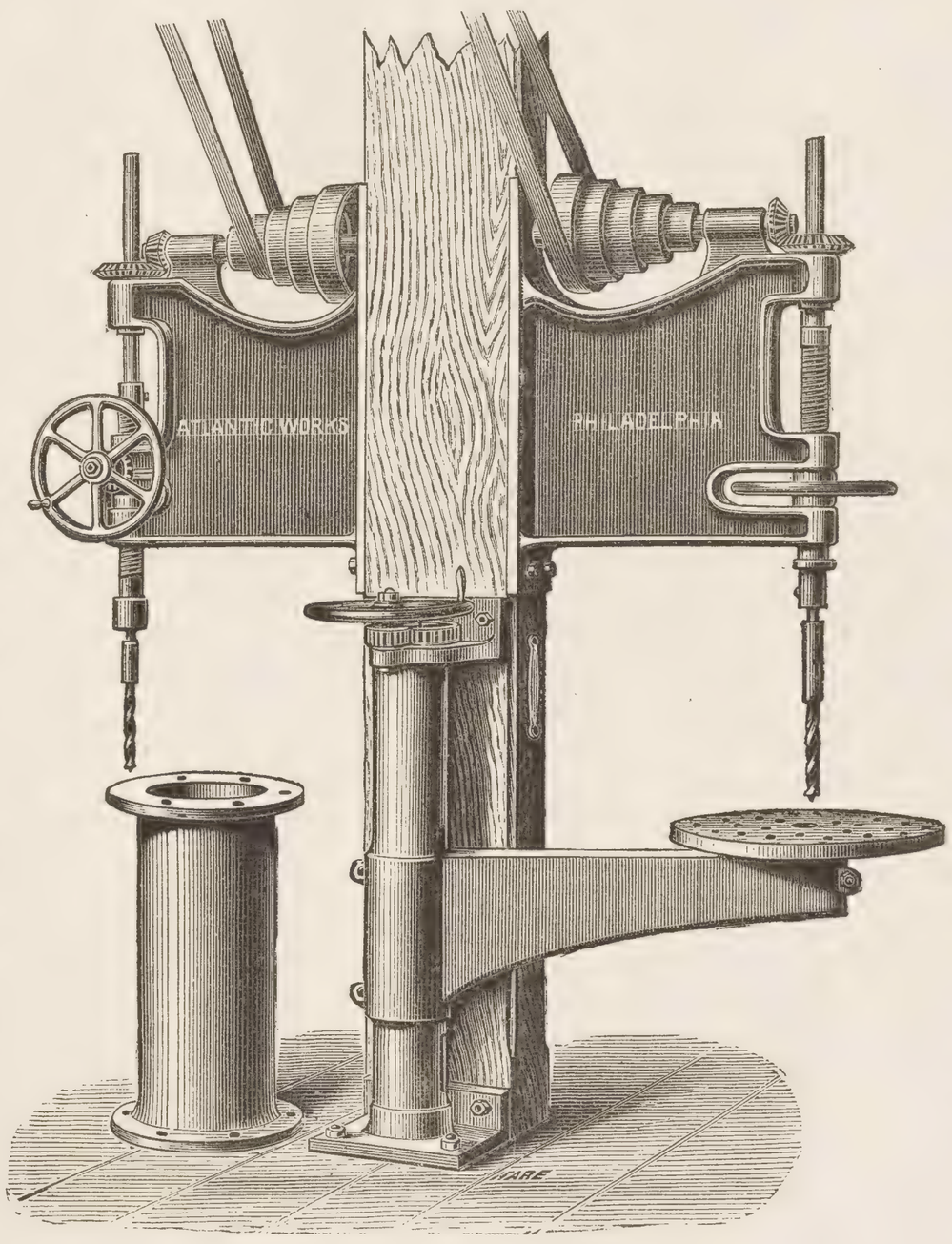
Improved Car-Brake.—Daniel T. Casement, Painesville, Ohio, at present residing at the Fifth Avenue Hotel, New-York City.—The brake-shoes are located between the wheels, and are fitted between stays, projecting down to the car-body, to rise and fall freely directly above the rails. Spring brake bands are attached to the ends of bars, and extend up over the wheels to fastening and adjusting screw and nuts, so as to be pressed on the wheels by said bars at the same time they (the bars) are pressed down. By the screw and nuts the springs can be readily adjusted to bear with the requisite force on the wheels while the shoes bear on the rails, or to cause them to lift and hold the shoes at various heights from the rails.

Improved Journal-Box.—Samuel Aland, Rome, N. Y.—The first part of the invention consists of a tubular box with a ball at the centre for being confined in a socket; also, for having a chamber for containing oil to lubricate the journal, with passages for the oil to the journal-box cast in one piece, whereby it is more durable than those composed of a tube fitted in a large hole in the shell of the box, and it can be made cheaper. The second part of the invention consists of a socket in the end of the box with a discharge passage from the bottom adapted to receive the drip escaping from the end of the box and conducting it to a receptacle, and a groove in the face of the shaft behind the shoulder of the journal, which prevents the drip from escaping along the shaft.

Safety Car.—Henry B. Myer, Philadelphia, Pa. No. 148,318.—The spring window-frames are held closed by a latch-bar, which is retained by a spring. The latch-bar is released by a lever actuated by a cord, to which tension is imparted by a spring drum, whose pawl is tripped by the telescoping of the cars. The side windows are opened in a similar manner, the cord being pulled as the car falls on its side, by spring slides which come in contact with the ground, releasing the latch-bars and opening the windows upon the upper side of the car.

Improved Car-Pusher.—Alva S. Bailey, Paxton, Ill., assignor of one half his right to Edward Little, of same place.—The object of this invention is to furnish to railroad employees and others a car-jack, by the use of which cars may be moved on the track without being required to wait for a locomotive, horse, or hands. The invention consists of a main beam, with clutch-end placed on the track, a slide-lever with rack and hook at the other end being applied to the car and acted upon by a cog-wheel at the end of a hand-lever, so that by successive applications the car is moved on the track.

The Pennsylvania and Baltimore and Ohio Railroad Companies have buried the hatchet.



Car-Builders' Drilling-Machines.

Drilling-machines of some kind are usually found in car erecting-shops, as much of the iron drilling can be done in these shops more conveniently than elsewhere. A table to support the work does not as a rule form a part of such machines, a wooden bench of considerable length being generally preferred. The reasons for this are, that the drilling is usually through thin bars or plates of a nearly uniform thickness, in which no special adjustment, other than the feed movement of the spindle, is required; and also because it is preferred to do the drilling upon wood blocks to prevent what may be termed "dropping through" in making the holes. To counter-weigh the spindles for this purpose is well enough in ordinary drilling, where the pieces are either heavy or bolted to the tables; but in drilling thin pieces, the piece can be made to rise more easily than the spindle and drill can drop down; hence the plan of drilling on hard wood blocks—a very effective way of going through without catching, because the wood retards and feeds the drill as it comes through.

The engraving represents a machine manufactured by Messrs. Richards, London & Kelley, proprietors of the Atlantic Works, Philadelphia. These machines can be attached to a wall or post, and when two of them are operated, as shown in the cut, a swing-table with a vertical adjustment is employed, and which can be used under either drill, in regular fitting work, or with a wooden bench, or to drill work on the floor. They can also be used for wood-boring, the same drills answering very well for this purpose—the machine in its compound or double capacity being a car-builder's, machine-fitter's, and floor-drill, also a wood-boring machine. It drills to the centre of five feet, and in its working is strong, durable, simple, and effective.

A Mutual Benefit Society.

The employees of the Great Western Railway have organized at St. Thomas, Ont., a society called the "Great Western Railway Air Line Employees' Mutual Benefit Society of St. Thomas," whose object is "to provide instruction and amusement, and to establish a fund to aid the members of this society in case of unexpected sickness or accident." All employees of the road are eligible; those wishing the benefit of the sick fund must subscribe to the rules respecting it. All pay $1 a year, and subscribers to the sick fund 50 cents per month in addition. These subscribers must be residents of St. Thomas, at least 18 years of age, receiving at least 60 cents per day, and in good health. But apprentices and lads may pay half as much and be entitled to benefits to half the amount of other members. The benefits are: 1. To those who have been rendered unable to work by sickness or accident for six working days, an allowance of $3 a week for 12 weeks, of $2.50 a week for the 12 succeeding weeks, and of $2 per week for the next 30 weeks. 2. In case of a member's death, an allowance of $25 for funeral expenses. The surplus of the sick fund is to be divided annually among the members in proportion to their contributions to it, 50 cents each being reserved for contingencies. The officers elected for the first year are: W. White, station-master at St. Thomas, President; J. Woodman, Vice-President; H. P. Forrest, Secretary; W. R. MacKenzie, Treasurer, with a committee of nine members, two thirds of whom can admit any employee duly proposed for membership. The Great Western Company has given the use of a room at St. Thomas station to be used as a library and reading-room, and several of the company's officers have given books and other aid.

The Pennsylvania Railroad, it is said, will not remove its car and machine-shops from Fort Wayne, Indiana, their magnitude being such as to render their removal impracticable. The buildings cover an area of ten acres, and an average force of 1000 men is employed. The car-shops have turned out during the past year 10 Pullman cars, 1000 freight-cars, 12 day-passenger cars, and a number of refrigerator cars to run between Chicago and New-York. The machine-shops have, during the same period, completed 20 first-class locomotives for freight and passenger service.

It is not generally known that steel can be made so hard that it will pierce any known substance but a diamond. Many jewelers and lapidaries have great trouble in getting the points of their drills hard enough to pierce an amethyst. For the benefit of miners and others using drills that require a hard point, we recommend the following manner of manipulation. The drills should be held, if small, by hot pincers or tongs, while tempering. First heat the tool to a white heat, and then press it into a stick of sealing-wax; leave it but a second there, and then stick it into the wax in another place. This operation is rapidly repeated until the graver is too cool to enter the wax. In turning or drilling, the tool is moistened with oil of turpentine.

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Editorial Announcements.

Correspondence.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

Advertising Rates.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. Dinsmore, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Engravings and Illustrations.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in The National Car-Builder *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

The Annual Conventions.

The Railway Master Mechanics' Association will hold its seventh annual convention on the 12th inst., at Chicago. The Supervisory Committee has been busy for some time past in making arrangements for the accommodation of a large number of delegates, and it is expected that the attendance will be fully equal to that of previous years. Many important subjects of vital interest to railroads will come up for discussion, and a number of reports will be presented by special committees appointed at the last annual meeting. The officers of the Association have recently issued a very judicious and well-timed circular, addressed to the presidents and superintendents of railroads, setting forth the objects and purposes of the organization, and soliciting such counsel and co-operation as will tend to promote the welfare of the society. The circular will be found on another page.

In view of the fact that this association, as well as that of the Master Car-Builders', has been in existence a number of years, and the doings of each at their regular annual meetings widely published, it would seem that railroad officials of every grade ought by this time to be pretty well informed in regard to the nature and character of each. It is hardly credible that superintendents and managers of railroads are so indifferent to the important interests committed to their charge as not to see that they are identical with the prosperity of these associations. If locomotive and car construction had already reached a degree of perfection as regards safety, economy, and efficiency, that admitted of no further improvement, the case would be different. This point, however, has not yet been attained; nor is there any thing like uniformity of opinion or practice with respect to many important details. There must be continued inquiry and investigation by means of organized effort, and such organizations, to be successful, must receive the aid and encouragement of those for whose benefit such effort is designed. For railroad companies to say that no benefit is derived from the associations referred to, sufficient to justify furnishing passes or paying the hotel bills of their members while attending the annual meetings, is manifestly absurd. We are free to admit that for a very large proportion of the benefits actually realized, there is no direct, tangible evidence, for the reason that in the nature of the case such benefits are mostly of a negative character, yet none the less actual and affecting the available net profits, which, at the end of the fiscal year, may be a whole dividend more than they would have been had one or two accidents, more or less, occurred, but which did *not* occur in consequence of the adoption of better mechanical methods recommended by, and originating with, these associations.

The Master Car-Builders' Association will meet at Cincinnati on the 10th of June, and we trust that every member duly appreciates the importance of a full attendance, as well as the necessity of maturing, as far as possible, the preliminary work in the hands of committees, so that the business of the convention may not be delayed by any lack of such preparation. The various subjects to be considered are known in advance; and as the sessions are limited to a certain number of days, (usually not more than three,) it is incumbent upon every member to have his views upon such subjects so well matured that they can be presented clearly and definitely, and thus save a good deal of time that would otherwise be consumed to little or no purpose. It has been no unusual thing at previous meetings for important matters to be neglected or postponed, or only partially considered, because the time which should have been devoted to them has been frittered away in talking about collateral and incidental points, or in attempting to do in convention work which could be done much better by committees. While it is essential to the well-being of the association that every member should be present and participate in its proceedings, it is at the same time equally true that the larger the body the more unwieldy and cumbersome it is, unless the business to be done is properly presented, and the proceedings conducted, as far as practicable, in accordance with the rules and usages of parliamentary practice.

The organization is a growing one, and if sustained by earnest and systematic effort, will increase in membership and practical usefulness year by year. Nearly a hundred responded to the roll-call at Boston last June. About forty of these were new members. Many old members were absent, and a number of roads were unrepresented. This was doubtless owing to the remoteness of the place of meeting from the geographical railroad centre. Cincinnati is much more central and accessible, and were it not for the continued depression in general business, and the rigid economy in railroad and individual expenditure which prevails, we should look for a larger attendance at the eighth annual convention than at any previous one. We can not think that any superintendent or manager who has carefully read the official report of the Boston meeting, will be willing to have his road unrepresented at Cincinnati, or that the necessary passes will not be readily furnished unless legally prohibited. The average salary of a master car-builder is by no means excessive, and to expect him to pay regular fare for long distances, and hotel bills for four or five days, in addition to his share of the expense of keeping up the association, merely to transact business intended altogether for the benefit of his employers, is to expect what is unreasonable. Whatever may be the obstacles interposed by "hay-seed" legislation or false ideas of economy, we trust every member of the association will spare no effort to be present.

The special subjects to be considered, as appears by the committees appointed at the last convention, are likely to elicit much interesting and profitable discussion, and perhaps some decided action. We have reason to believe that these committees have not been idle since the adjournment, and that a number of important reports may be looked for. Among the subjects assigned to these committees are train power-brakes; heating, lighting and ventilation of passenger-cars; size and framing of passenger and freight cars; exhibition of models and machinery; "Dictionary of Terms," etc.

With respect to the Dictionary, we are able to announce that it is rapidly approaching completion, not in any vague, indeterminate sense, as we might speak of some "Rapid Transit" scheme or the East River bridge, but really and actually; and when it *is* completed, it will be found so comprehensive and well arranged as to fully justify the time and labor expended in its preparation.

Association Rooms for Master Car-Builders.

A committee was appointed at the last annual meeting of the Master Car-Builders' Association, to report upon the expediency of opening rooms at the principal railroad centres in different parts of the country, such rooms to be used as a business and social exchange for car-builders and railroad men generally. This movement was suggested by the experiment which has been in successful operation in this city since December, 1872, at which time the Association rooms in Liberty street were opened, and where regular monthly meetings have since been held. We think that all who have participated in these meetings appreciate the advantages to be derived from them, and the convenience of having a place which is the recognized head-quarters of members of the organization. The principal room is spacious and well furnished, and open at all times except on Sundays; a register is kept in which the names of visitors are entered, and there are also facilities for writing, and files of the principal railroad and scientific papers. The rooms are also a depository for models and drawings illustrative of railway mechanism, and especially of new devices pertaining to car construction. Many of these have been contributed and remain permanently in the rooms, while others are the property of inventors and remain on exhibition only for a time. The regular monthly meetings have been well attended from the first, and are the means of communicating and making available much valuable scientific and mechanical information of special service to car-builders. The subjects for discussion are announced a month in advance, and any one present is at liberty to present his views, and also to exhibit and explain any invention or device pertinent to the special topic under consideration. Although these meetings are presided over by a chairman, who is usually an officer of the Association, the proceedings are not so rigidly formal as to obstruct the free interchange of opinion; and the discussions frequently become more conversational than otherwise. Aside from the agreeable social intercourse which is a marked feature of these monthly gatherings, they afford an opportunity for consultation and comparison of views upon unsettled mechanical problems, as well as for canvassing the merits and testing the claims of rival inventions which are constantly being pressed upon the attention of railway men.

We do not know what the views of the committee are in reference to the propriety of opening rooms for a similar purpose in other places. Two of its members live at distant points, and have had little or no opportunity to see for themselves the working of the experiment here; but from our own observation, we are inclined to think that similar rooms might be opened at points like St. Louis, Chicago, and perhaps other places, with advantage to the Association and to the interests of car rolling-stock with which it is identified. We hope the committee will make a report at the June meeting, and any additional information that may be needed touching the ways and means of defraying the expense of such rooms will be forthcoming at such time.

Exhibitions of Inventions, etc., at Cincinnati.

At previous annual meetings of the Master Car-Builders' Association, no special provision has been made to enable inventors, manufacturers, and dealers to exhibit in a satisfactory manner, the various devices and materials used in the construction and maintenance of cars, and the result has been that such exhibitions have been attempted in the room where the regular sessions of the Association have been held, and the proceedings more or less interrupted thereby. In order to give those desiring to exhibit such devices and materials an opportunity to do so, and also to enable the members of the convention to give them a fair inspection, a committee was appointed at the last annual meeting to rent a suitable room at Cincinnati for this purpose, and publish an invitation to manufacturers and others to send to it such articles as they might wish to exhibit—one evening during the session of the convention to be specially devoted to their examination.

We do not know what progress, if any, the committee has made in carrying out this arrangement, but we have no doubt it will receive due attention. We therefore take the liberty of notifying parties who are desirous of sending articles for exhibition, to communicate with the Chairman of the Committee, W. H. H. Allison Esq., of the Cincinnati, Hamilton, and Dayton Railroad, Cincinnati, Ohio. The other members of the committee are Mr. J. L. Hackathorn of the Kentucky Central road, and Mr. Samuel Griffith, of the Indianapolis, Cincinnati, and Lafayette road.

Freight-Cars and Country Wagons.

"A common, well-built country wagon, weighing about 800 pounds, will carry 3000 on any fair country road, and without injury pass over obstructions which cause it to fall one, two, or more inches, the paying weight being about 79 per cent of the whole. The ordinary box-car in use upon our railways at the present time weighs about 10 tons; its maximum load is generally about 11 tons, while its average load is about 8 tons; the paying weight being from 44 to 52 per cent of the whole. It does not seem reasonable that the weight of a car constructed to run upon a smooth, even track, without a fall, should be so disproportioned to the load carried. There is here a chance for inventors to devise a light form of freight-car, strong enough to carry 11 tons."

The above paragraph, which we copy from an exchange, embodies a statement made by Mr. William P. Shinn, at the last annual convention of the American Society of Civil Engineers. It is apparently a very plausible argument in favor of lighter freight-cars; but when the comparison between a well-built country wagon and an ordinary box-car is carefully scrutinized, it will be seen that there is not much analogy in the two cases. The rate of speed of a loaded wagon on a country road rarely exceeds four miles an hour. It is, at the same time, an isolated vehicle, subject to no concussions and no draught strain incident to a train of cars, while the weight per wheel does not in the case supposed exceed 875 pounds. An eight-wheeled box-car loaded with 11 tons of freight, imposes a weight upon each wheel of about 4600 pounds—this of course including the freight and entire car, excepting the wheels and axles. The speed varies from 10 to 20 miles an hour, and the blows delivered at the rail-joints, where the difference in the elevation of the rails is sometimes very considerable, are in proportion to the weight and speed. The car also, having no independent movement, but constituting an integral part, and usually a very small part of a train, is subjected to continual strains of draught and concussion which have little or no application to the wagon. It will thus be seen that the two kinds of service are entirely different, and preclude the possibility of constructing a car that will carry any thing like the same relative proportion of paying freight as the wagon, without a liability of its being speedily knocked to pieces. The excess of dead-weight over and above the wagon standard, inseparable from an ordinary freight train, is the toll or penalty exacted by mechanical laws for the privilege of transporting by a single motor, at a rate of speed from three to five times greater, 200 tons of paying freight, instead of a single car or wagon load.

We believe a very considerable reduction can be made in the weight of ordinary freight-cars, and that such reduction will be made; but for the reasons above mentioned, a well-built country wagon with its 79 per cent of paying weight, is not a proper standard for regulating the weight and carrying capacity of such cars.

Car-Builders' Monthly Meeting.

The regular monthly meeting was held at the rooms of the Association, on Thursday evening, April 16th. Present, Messrs. V. D. Perry, C. A. Smith, George Dunham, F. D. Adams, George Hackett, D. H. Baker, L. Garey, M. N. Forney, E. A. Olmstead, E. Lockwood, C. E. Garey, W. E. Partridge, and others.

The meeting was called to order by Mr. V. D. Perry, the Vice-President of the Association, who stated that the subjects for discussion were Journal-Bearings,

CENTRE-PLATES AND SIDE-BEARINGS.

Mr. L. Garey made an inquiry as to how many roads lubricated centre-plates and side-bearings, and what was the general impression as to the necessity of such lubrication. He believed himself that it was necessary, in order to secure greater freedom to the movement of the truck, prevent the wheel-flanges from being pressed against the rails in curving, and lessen the liability of getting off the track.

Mr. Adams thought the liability to leave the track was caused by excessive weight on the side-bearings. This was the primary difficulty. It could, of course, be diminished by lubrication, but as the bearings were constantly exposed to dust and dirt, they were apt to be badly cut by the pressure upon them. He thought the car-body should rest mainly on the centre-plate, and then the trucks would curve more easily. The side-bearings were designed, not so much to support the car, as to keep it from rolling.

Mr. Garey had had some experience in moving cars by horse-power on the short curves of street-railways, and was compelled to lubricate the centre and side-bearings in order to get loads of 20 tons over the track. He spoke of a freight train on the Harlem road, from which a car was lost from the centre of the train, and the engineer did not know it until he had occasion to count the cars at a station some time afterward. He then remembered that the train had broken at a certain place on the road. He made the connection and went on. The missing car was afterward found in the ditch, having been forced from the track in curving, by the excessive friction of the centre and side-bearings. Mr. G. thought that most roads used centre-plates too large in diameter.

Mr. Lockwood said that an experience of thirty years on the Camden and Amboy road, had satisfied him that a well lubricated centre-bearing was the safest. Many of the sleeping-coaches bore heavily on the side-bearings, and it was a common thing for the centre-plates not to "bottom" at all.

Mr. C. A. Smith said that although new cars at first took a bearing at the centre, they sooner or later got down on the sides, no matter how the centre-plates turned. He favored a side-bearing consisting of a piece of iron with the two ends shaped like segments of a circle, and connected by a strut, the curved ends working in slots in the truck and body-bolsters, and being practically a loose wheel which would enable the truck to curve without friction. The distance of the side-bearings from the centre was an important matter to be determined. He would like to dispense with them altogether if it could be done; but a car with only a centre-bearing was liable to rock badly if the freight was unevenly loaded. An excess of weight on the side-bearings kept the truck, after turning a curve and passing on to a straight track, out of line, and the wheel-flanges bearing against the rails.

Mr. D. H. Baker favored wide centre-plates, and thought they would last twice as long as narrow ones. Rollers for side-bearings were of no use whatever, as they were sure to wear flat.

Mr. Adams suggested a side-bearing to be made of rubber balls working in concave socket grooves, but it was objected that they would wear flat.

The discussion becoming conversational, we shall only attempt to give the tenor or drift of what was said. With respect to the distance of side-bearings from the centre, it was conceded that theoretically the best position of side-bearings, as well as hanger-links and springs, for giving lateral stability to both car and truck, was to place them directly over the rail, but with the present style of construction it was impracticable to do so. The length of trucks was incidentally discussed. In former times the wheel-base was made very short, so that the flanges of the wheels nearly touched, under the mistaken idea that the trucks would curve easier. There were trucks now in use with axles only 3 feet 8 inches from centre to centre. Mr. Adams stated, that for the last three years the Boston and Albany road had built their passenger-trucks with a 7-foot wheel-base; and if he were to begin again, he would make them 8 feet, and with stronger equalizing bars. It had been clearly demonstrated that within a certain limit, dependent of course on gauge and radius of curve, the longer the wheel-base, the easier the trucks would pass the curves.

IMPROVED DRAW-BAR COUPLER.

Mr. Daniel J. Tittle, of Albany, N. Y., exhibited an improved automatic draw-bar coupler, the manifest merits of which attracted much attention. It is called the "Double-Latch Car-Coupling," and its operation was very satisfactorily illustrated by model cars moving on a curved track. It consists of an arrow-headed draw-bar placed in the usual position under the platform, and having a free lateral motion in a wide yoke. It is held in a central position by springs, except when forced from such position in running upon curves, or by uncoupling. The shoulders of the arrow-heads are square and at right angles with the draw-bars, and in coupling latch into each other on either side. They are prevented from uncoupling by slipping a ∩ shaped fork or pin through a hole in one of the heads, and over the neck of the opposite bar. The bar can be moved laterally for uncoupling, either from the side, top, or platform of the car. It has the usual draw-bar buffer spring behind it, while underneath is a double compression buffer, to resist concussion.

The advantages claimed for this device are, 1. The cars can be coupled or uncoupled at any time and on the shortest curves, right or left, without endangering life or limb. 2. When coupled and secured with the fork-pin, they will not uncouple on the shortest curves until the pin is removed, which can be done while the train is in motion and without slacking up, either from the platform or top of a car. 3. The difficulty and loss of time in uncoupling cars held together by compression are avoided, the uncoupling being easily accomplished when the fork-pin is removed. 4. The superiority of the wide yoke over the narrow one which is ordinarily used, the latter preventing coupling on very slight curves even, while the former, in connection with the arrow-headed double-latch draw-head and long bar with springs on both sides, is indispensable for that purpose, and enables the brakeman to couple or uncouple at any time and at all points.

The working of the device as exhibited in the models, produced a very favorable impression as to its utility, safety, and economy. It is equally applicable to freight or passenger-cars, and can be adapted to the old style of draw-bars, or when the height of coupling varies from six to twelve inches. The inventor promises to send us suitable drawings, by the aid of which, we hope to give a better idea of the invention in a future number.

The meeting then adjourned. The same subjects will be resumed at the next meeting, on Thursday, May 21st.

The Master-Mechanics' Association.

THE following address has been issued by the officers of this Association, explaining the objects of the organization and soliciting the coöperation of railroad managers:

To the Presidents and Superintendents of the Railways in America:

GENTLEMEN: We respectfully solicit your attention to the objects and purposes of our organization, established in September, 1868, under a constitution which limits the membership exclusively to persons having charge of the motive power of railways, as superintendents of machinery, master-mechanics, or foremen. Our earnest desire is to make this Association a means of diffusing among railway managers comprehensive knowledge of the mechanical arts, as applied to the construction and operation of railway machinery.

To accomplish this, annual meetings are held, and appropriate committees appointed, whose duty it is to gather from all parts of the country the ideas, practice, and experience of manufacturers and mechanics, to carefully examine and digest them, and present to the Association elaborate reports thereon. In this manner a valuable fund of information will be accumulated for the professional guidance and benefit of railway officials, motive power departments will be managed with increased efficiency and economy, railway corporations will be directly benefited, and great advantage will accrue to the traveling public.

Nearly one-half the cost of operating railways is expended in the mechanical departments, and that which tends to perfect the conduct of this branch of the service will materially lessen operative expenses.

Eminent railway mechanics entertain diverse opinions regarding important details of construction of locomotive engines, regarding the correct proportions of various parts; the strongest and simplest mode of building and bracing locomotive boilers, to insure them against explosion; the most efficient form and construction of fire-boxes, to develop the value of the different kinds and qualities of fuel; the relative value of iron and steel plates for boilers, and especially of copper, iron and steel, for furnaces and flues; the relative safety and economy of iron and steel tires, axles, crank-pins and truck wheels; the causes and preventives of boiler explosions; and a multitude of kindred topics, embracing a wide range and thorough knowledge of the arts and sciences, as applied to the details of manufacture and management of the locomotive engine.

These diverse opinions we seek to harmonize by interchange of thought, and systematic investigation of views presented and opinions expressed. The solutions of the various questions will be placed in the hands of competent mechanics, and from the experience and practice in our branch of the service, gathered from all portions of the country, we hope to deduce conclusions that will form a basis for future guidance and action.

Our Association is not framed from motives of personal aggrandizement, nor for the advancement of self-interests, or to further selfish ends; but we, as earnest workers for the greater development of the mechanical arts in this the "iron age," seek through our organization a broader and deeper knowledge than we have to-day.

With these ends in view, we request your coöperation and aid in our important undertaking. Our interests are identical with yours, and while we feel dependent, to a great extent, upon you, gentlemen, for the success of our enterprise, we believe that this identity of interest will insure your support. You look to us for knowledge in our branch of the service, and expect mechanical skill and ability in the performance of our duties; that we may be able to fill the measure of our desires and your expectations, we solicit your powerful influence in promoting the welfare of our society.

With your aid and our earnest endeavors, success is insured. We beg leave to suggest that you call the attention of your Master Mechanics to the importance of attending our annual conventions, and aid in effecting the objects of the Association; and also that you place their names upon your exchange list for annual passes.

We shall at all times be happy to receive from you such counsel and suggestions as you may deem promotive of the welfare of our organization.

We remain, gentlemen, very respectfully yours,

H. M. BRITTON, President,
N. E. CHAPMAN, 1st Vice-President,
W. A. ROBINSON, 2d Vice-President,
J. H. SETCHEL, Secretary,
Supervisory Committee.

Free Passes to the Conventions.

MR. J. H. SETCHEL, Secretary of the Master-Mechanics' Association, writes to the *Railroad Gazette* that he is not aware that any resolution has ever been adopted by the Association of Railroad Superintendents to prevent the giving of free passes to railroad master-mechanics and master car-builders to enable them to attend the annual meetings of their respective associations; and that he has yet to hear of the first instance of a pass being refused when application for it was properly made; and furthermore, that there is a general expression in favor of these associations among leading railroad officers and prominent members of the Superintendents' Association. Mr. Setchel also says that he has written to a large number of railroad officers on the subject, and the replies are, without exception, favorable to both associations, and the issuing of free passes to all members who desire to attend the conventions.

Amateur Railroading.

THE Fredericksburg and Gordonsville Railroad Company has some seventeen miles of road completed from Fredericksburg, Va., to Parker's Store, which is not now operated. Some of the means devised by the people on the line to make use of the track, are thus described by the Fredericksburg *Ledger*: "A gentleman who is residing here, who is the owner of a small stationary engine, has attached to it a flat car on the Fredericksburg and Gordonsville Railroad, and with a molasses-hogshead for his water-tank, runs up and down the road between this city and Parker's Store for freight and passengers. One of those indefatigable geniuses peculiar to the Wilderness of Spotsylvania, becoming disgusted with the tardy movements of the railroad company, and fearful that his hoop-poles, if kept much longer on hand, would not be merchantable, conceived the novel idea of hauling his poles to town on a flat-car drawn by a young bull. The car was loaded with 100 bundles of poles. There was some difficulty in teaching the bull exactly what was expected of him. The *modus operandi* was as follows: The bull drew the car up the grades, and was then unhitched and mounted on a platform at the rear of the car, which then ran down grade without help. As soon as his bullship got the hang of the thing, he took it very kindly, dragging the car up the grades with great alacrity, and evincing the same pleasure in riding down that is shown by boys who drag their sleighs up-hill for the pleasure of sliding down again.

Artesian Wells for Railroad Purposes.

THE Union Pacific Company began last year the boring of six artesian wells in the arid districts, in order to obtain supplies for locomotives, which had been in part supplied by water trains. The first well is at Separation, 724 miles from Omaha, and the last one is at Rock Springs, 832 miles. Another is in progress at Red Desert. The well at Rock Springs is 1,145 feet deep; the bore is six inches in diameter. In all the wells it was necessary to tube a great part of the way. At Rock Springs the water rises from the depth of 1,145 feet 26 feet above the surface, and discharges 571 gallons per hour, and at the surface, 960 gallons At Point of Rocks, 25 miles east, the well is 1,000 feet deep. The water rises only to within 17 feet of the surface, whence it is pumped, but the supply is abundant, and the quality of the water is the best of all the wells. The next well is at Bitter Creek, 21 miles east of Point of Rocks. It is 696 feet deep. It yields, by pumping, 2,160 gallons an hour, and at the surface it flows 1,000 gallons an hour. Next, to the east, is the well at Washakie, 33 miles distant. It is 638 feet deep, and at 15 feet above the surface it flows 800 gallons an hour. At Creston, 14 miles east, the well is 326 feet deep, and an ample supply of water is obtained. At Separation the well is 1,103 feet deep, and water comes within 10 feet of the surface, which by pumping yields 2,000 gallons an hour.

In some of the wells the water has 280 grains of salt in solution, and the incrustation is considerable but altogether the wells have been a success, and it is said the cost of running water trains since the wells have displaced them would have paid for the wells.

The Hitchcock Car-Ventilator.

THIS method of ventilating railway cars has been in use for a number of years, and, according to the testimony of those who have tried it, it continues to give entire satisfaction. The ventilators are located as usual in the car-roof, each with an outside projection facing alternately forward and backward, the former admitting the air, and the latter affording an exit. The operation of the two sets is reversed when the direction of the car is changed, so that either set can be used for exhaust and supply. Dust and cinders are intercepted by shields set at right angles with the car side, while the air is forced into the car through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, and as this takes place along the sides of the roof, the occupants are not exposed to any direct draught. The ventilators, once put in place, do not have to be changed, and they are noiseless in their operation. We refer to our advertising columns for engravings and description of the same.

THE earnings of the leading railroads of the country during March show a considerable falling off as compared with those for the corresponding month last year, although the exhibit is a more favorable one than that for February. Seventeen roads show a total of gross earnings amounting to $8,326,729, a decrease, compared with the corresponding season last year, of $879,574. The net earnings have not, however, fallen off in the same proportion; many of the companies having reduced their rolling-stock and forces, in proportion to the decline in business, caused by the working of the money markets and the unsatisfactory condition of general trade.

AN exchange says, "One of the infinite variety of swindling dodges is now being tried on many a Yankee inventor in the shape of a circular from a fictitious 'Mississippi Valley Manufacturing Company,' of Vicksburg, desiring to buy the right to manufacture his invention for the trade of the South; offering him very advantageous terms, and requesting five dollars to help pay for examining the patent. The fraud is transparent."

THE Chicago and Illinois River Railroad Company has put a party of engineers into the field to finish the location of the line from Chicago to Streator, by way of Joliet and Wilmington. A considerable amount of work has been done in the vicinity of Wilmington.

ON the Detroit and Milwaukee Railroad, in Michigan, nearly, if not all, their engines are supplied with a separate bell situated in front of the boilers, on the platform immediately over the pilot. The bell is so arranged that every revolution of the truck-wheels produces a blow. It can be thrown out of adjustment when desired.

THERE is a piece of track on the Kansas Pacific Railway that is thirty miles long without a curve, and no grade that is more than three feet to the mile. The light of an engine can be seen for a distance of fourteen miles on this strip.

A GENTLEMAN representing the projectors of a new railway in the northern part of Wisconsin called on one of the most prominent and liberal railway presidents of New-York to solicit his co-operation in the construction of the road. "No, sir," said the president, "we can't think of touching a Wisconsin railway. Your law won't let us."

ONE of the buildings connected with the car department of the Lake Shore and Michigan Southern Railway, at Cleveland, Ohio, was destroyed by fire on the 13th of April. It was stored with lumber of the choicest kind, such as is used in the construction of palace-cars. A considerable portion of it had been in store for several years, and was thoroughly seasoned. A large number of cars had to be removed, and many of them narrowly escaped destruction. The building and contents were entirely consumed. Loss estimated at $30,000, upon which there was no insurance.

THE novelty known as Speer's Traveling Side-Walk, a charter for which is now pending in the Legislature of New-York, consists of a series of connected platforms. propelled by 125 horse-power engines, stationed about a mile apart. These platforms are to be raised above the curbstone, and project partly over the sidewalk and partly over the roadway. It offers, in short, an endless pavement, or rather two pavements moving in opposite directions. It will avoid the crowding of passengers; they will gain above their ordinary walking speed, because of the speed at which the machine is moving under them. Small side-platforms are provided, on to which the person steps when he wishes to get off, thus causing no stoppage to the train. It is said to have been already indorsed by competent engineers.

A NEW fireless locomotive, built at the Grant Locomotive Works, was recently tried at Paterson, N. J. It has four wheels, 36 inches in diameter, and 7 x 10 inch cylinders. The boiler is 37 inches in diameter and 9 feet 6 inches long, and the whole engine empty weighs 6 tons. On the trial, with the water heated to a temperature equivalent to a pressure of 150 pounds per square inch, the engine ran, with an ordinary loaded horse-car, a distance of 7 miles. The track on which the trial was made is an ordinary horse-car track, laid on a common road, with very heavy grades for short distances in some portions. The steam pressure after running the distance named was reduced to 40 pounds.

AT the close of the war, the government held a large quantity of rolling-stock and railway material in different parts of the South, and, as the best that could be done, sold it to the different companies on credit. The several railroad companies in that section being in various degrees of dilapidation and insolvency, not to be wondered at under the circumstances, were happy to get any thing on credit, and have paid up to June 30th, 1873, the sum of $5,116,605.53, leaving still due $4,558,924.07. The number of railroads originally indebted was sixty, but there are now only fifteen on the list.

SIXTY miles of the Cairo and St. Louis narrow-gauge railroad have been in operation for some time, and passenger-trains run this distance in 4 hours and 50 minutes and make 16 stops.

THE patentee of the punch now used by the passenger railroad companies is said to make over $50,000 per annum. The temperance furor will most likely reduce it somewhat.

THE Cummings Car-Works at West-Bergen, N. J., have recently shipped a lot of milk-cars for the New-Jersey Midland, and an outfit of special cars for a traveling circus.

THE Indiana Car Company, of Cambridge City, Indiana, have been in full operation since the 15th of February, on 500 cars for the Baltimore & Ohio, Marietta & Cincinnati, and Red Line companies, employing over 300 men. Their works have a capacity of six box-cars per day.

THE Dickson Manufacturing Company of Scranton, Pa., has restored the 10 per cent taken from the wages of employees last fall.

THE *English Mechanic* says that a trial trip was made, March 17th, on the Midland Railway from Derby to London, with a train consisting of two of the new Pullman cars. The distance is 129 miles. The train left Derby at 2.30 P.M., and arrived at London at 5 P.M.; running time, 142 minutes. On a portion of the line, 16 miles were run in 13½ minutes, and on another portion 20 miles in 19 minutes. Highest speed, 72 miles an hour.

A CONVENTION of Railroad Purchasing Agents will be held at the Grand Pacific Hotel, in Chicago, on the 17th of June.

How a railroad opens up a new country is demonstrated very remarkably by a comparison of the United States census of 1870 with the territorial census of 1873. This shows that between those years all the counties on the line of the Denver and Rio Grande have either trebled or quadrupled in assessed wealth and population.

THE new buildings of the Michigan Central Railroad at Grand Trunk Junction, just outside of Detroit, will all be brought into use during the present month. The old round-house, paint-shop, passenger-car repair-shop, and the car department offices in Detroit will be torn down, and the ground now occupied by them used as an additional freight-yard.

THE general offices of the Indianapolis, Bloomington, and Western Railroad, situated at Urbana, Ill., will be removed to Indianapolis.

THE Toledo, Wabash, and Western Railroad Company has an elevator about completed at Toledo, having a storage capacity of 1,200,000 bushels.

MAJOR JUDSON B. GAYLE, Superintendent of Machinery of the Raleigh and Gaston Railroad, died at his residence in Raleigh, N. C., April 7th, of consumption. He was 48 years old.

VALUE OF WALNUT TIMBER.—As an illustration of the increasing value of walnut lumber, the Indianapolis *Journal* notes that the standing walnut-trees on a half-section of land on Eel River, in Miami County, Indiana, were recently sold to a lumber dealer for $17,000. There is a large amount of other timber on the tract which is not included, only the walnut timber being sold. Walnut lumber is coming more and more into use throughout this country and Europe, and at present a very large business is done in preparing and shipping it from Indiana.

PARLOR-CAR TRAVEL.—The Boston and Maine Railroad Company have been running one parlor-car during the winter to Portland and return, and since the adoption of these cars on this line (July 14th to March 1st) there have been over 5000 passengers carried between Boston and Portland. These cars were planned and constructed at their works in Lawrence, and, in point of finish and comfort for invalids and travelers, they are not excelled by any Western car.

WE have received several numbers of the *Northwestern Lumberman*, a monthly journal published at Chicago, by Judson & Dicey. It has 16 four-column pages exclusive of cover, and is neatly printed on tinted paper. The contents embrace a variety of original and selected articles, items of current news, and elaborate market reports, having special reference to the great lumber interest of the North-west, of which it is the accredited organ.

Facetiæ.

A WAGON drawn by a yoke of long-horned Texas cattle and containing a good-looking woman, seven children, and considerable plunder, halted recently in Jackson, Minn. A man, a small boy, and a dog that had run to tail, were the adjuncts. The party were from Texas, and returning to their old home in Decatur County. An alderman of the town who had passed many years of his life in the Lone Star State, approached the wagon. He said to the woman, "From Texas, I presume?" "Yes, sir." "Didn't you like the country?" "No, sir." "Didn't you like the climate?" "Oh! yes." "Did you have good health out there?" "Yes." "Wasn't the land good?" "Yes." "How about the crops?" "Oh! we made splendid crops." "Well, then, ma'am, what on earth is your objection to Texas?" "Why, sir," she replied, "I couldn't stand the society in that rough country." And then she turned to the small boy, her son, and cried, "Sam, drive that dam dog out'en the dinner-pot; don't you see he's got his nasty snout into the vittils?"

THERE is a model old man described by a Peoria newspaper. He hasn't taken a bit of care of himself. He chewed tobacco sixty years, and got fat on it. He drank hard for twenty-five years, and got younger every day. His eyesight is so good that he reads his newspaper by moonlight through a microscope inverted to make the type small enough for his peculiar vision. He walks every morning four miles for his drinks before breakfast; he chops a cord of wood between each meal; he has tried to die of old age thirteen times, and failed every time. He attends to the wants of an old and feeble grandson, and superintends the funerals of his posterity with great care and decency.

IF you wish to know whether it is going to storm or not, all you have to do is to mind the storm vortex, and see which side of it is the most moist. Multiply this by the square of the latent heat, subtract the time of day, and divide by the weathercock. The result will be the rarefication, plus the thermometric evolution of the north pole; and then a wayfaring man, though a natural know-nothing, can tell what will follow.

TWO San Francisco barbers engaged to fight a duel, agreed to part and walk around a block, and when they got in sight of each other, to blaze away. When they turned the corner out of sight, both started on a run in different directions, and one has sent back from Alaska for his winter clothes, and the other has written to his wife from the City of Mexico, asking her to send his linen hat and palm-leaf coat.

"A HORSE! a horse! my kingdom for a horse!" cried a celebrated tragedian. "Wouldn't a jackass do as well?" inquired an affected young man rising in his seat. "Yes," triumphantly exclaimed the actor, "just step up this way, sir." The young man sat down.

A NEWSPAPER man is responsible for recommending salt water as a means to get rid of bed-bugs. He says the salt water will make the bugs dry, and while they are after a drink, you can move your bed into another room.

"THEY are rejoicing in new potatoes in Texas," writes a brilliant paragraphist. Of course, potatoes grow to a great size in Texas, but only a very small man could rejoice in one of them with any comfort.

AN honest farmer thus writes to the chairman of an English agricultural society: "Gentlemen, please put me down on your list of cattle for a bull."

A LADY, walking one day on one of the wharves in New-York, asked a sailor whom she met, why a ship was called "she." The son of Neptune replied that it was "because the rigging cost more than the hull."

JEWETT'S
PERFECTLY PURE
LINSEED
OIL
RAW, BOILED & REFINED.

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WASON MANUFACTURING COMPANY,
RAILWAY CARS, CAR WHEELS, AND RAILWAY CASTINGS,
SPRINGFIELD, MASS., October 4, 1871.

GENTS: We have used Prince's Metallic Paint exclusively for several years. If we did not believe it to be the best we would not use it. Yours truly, GEORGE C. FISK, Pres't.

CHICAGO, BURLINGTON AND QUINCY RAILROAD,
AURORA, ILL., March 5, 1873.

GENTS: We have used your Metallic Paint about 12 years, more especially on locomotive work, and before adopting it, put it to the most severe tests of extreme heat and strong brine. at the same time testing comparatively, lead (white and red) and other Metallic Paints, and in these tests the "Prince's" came out ahead. I am satisfied that for engine and other iron work it is superior to any paint in use. Our paint-shop was painted two coats with it and boiled oil in February, 1863, and the paint is in good condition at this date, not having been painted since 1863. Respectfully, D. C. COOLEY.

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WHITE LEAD
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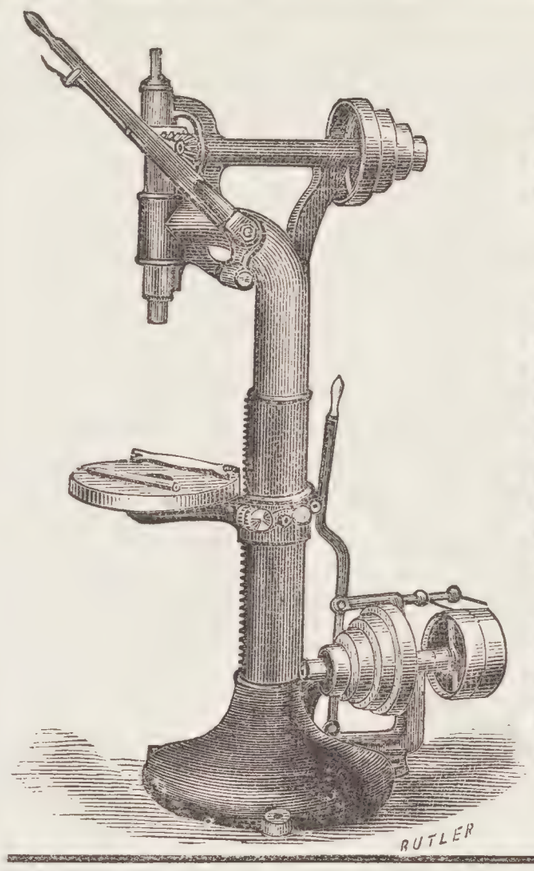

EDWIN HARRINGTON & SON,

Manufacturer of **ENGINE LATHES**, from twelve (12) to forty-eight (48) inches swing; **Hand Lathes; Wood Turning Lathes; Vertical Drills; Boring Mills; Tapping and Centring Machines; Screw Press** for Mandrels; **Grindstone Boxes.**

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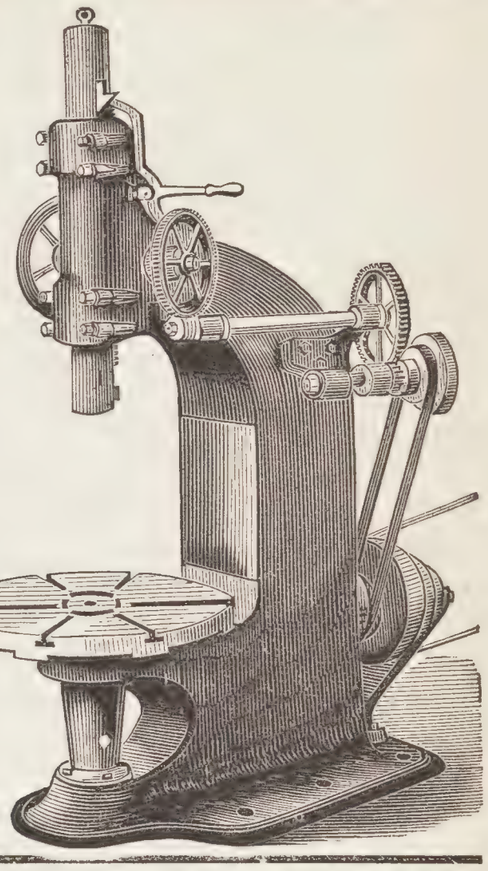

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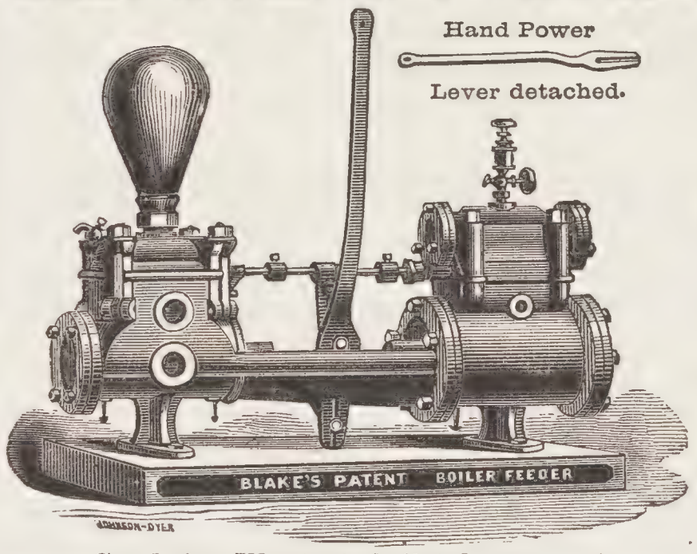

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ELASTIC WASTE. H.S.A. TRADE MARK.

IMPORTANT TO RAILROAD COMPANIES.

DEVLAN'S PATENT ELASTIC WASTE,

It being composed of Incombustible and Lubricating Materials, "Hot Journals" are impossible where the Waste is properly used.

Certificates from Railroad Officials, showing its very decided advantages, are herewith annexed—namely:

PENNSYLVANIA RAILROAD—NEW-YORK DIVISION, JERSEY CITY, July 11, 1873.

GEO. W. BARKER, ESQ., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872, I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your resquest herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

OFFICE, ELASTIC WASTE COMPANY, No. 60 BROADWAY, NEW-YORK.

E. D. ALBRO,

507 to 515 West Sixth St., Cincinnati, Ohio.

Manufacturer and Dealer in all kinds of

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of various thicknesses, for CAR BUILDERS, which he is offering at ***SIXTEEN (16) CENTS*** per foot, BOARD MEASURE, hard close-grain ***FRONTERA MAHOGANY.***

French and American Burl Veneers, Birds-eye Maple and Ash Veneers, especially adapted for Car Panels, etc.

1-4, 3-8, and 1-2 inch Black Walnut, seasoned, for Panels.

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Arlington Car Manufacturing Co.....Arlington, Vt.
Atlantic Car-Works .....Salem, Mass.
Barney & Smith Manufacturing Co.....Dayton, Ohio.
Baker, Jackson & Co.....Latrobe, Pa.
Bellefonte Car Manufacturing Co.....Bellefonte, Pa.
Billmeyer & Smalls.....York, Pa.
Bradley, Osgood.....Worcester, Mass.
Bridgeport Car-Works.....Bridgeport, Pa.
Brill, J. G. & Co.....Philadelphia, Pa.
Buffalo Car Co.....Buffalo, N. Y.
Canada Car Co.....Toronto, Canada.
Canada Steam-Engine Co.....Kingston, Canada.
Canda, F. E. & Co.....Chicago, Ill.
Cartersville Car Co .....Cartersville, Ga.
Central Car & Manufacturing Co.....Jackson, Mich.
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Corunna Car Co... .....Corunna, Mich.
De Pere Iron-Works.....De Pere, Wis.
Detroit Car-Works.....Detroit, Mich.
Detroit Car and Manufacturing Co.....Detroit, Mich.
Dawson Manufacturing Co.....Dawson, Ga.
Dickey, Neill & Co.....Toronto.
Dickson Manufacturing Co.....Scranton, Pa.
Erie Car-Works.....Erie, Pa.
Elmira Car-Works.....Elmira, N. Y.
Frederick & Co.....Catasauqua, Pa.
Freas Brothers & Thornton.....Berwick, Pa.
Fremont Car Co .....Fremont, Ohio.
Gardner, F. & Co. .....Carlisle, Pa.
Gill, John L.....Columbus, Ohio.
Gilbert, Bush & Co.....Troy, N. Y.
Goold, James & Co.....Albany, N. Y.
Goodrich Car Co.....Augusta, Ga.
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Jackson & Woodin Manufacturing Co....Berwick, Pa.
Jones, J. M. & Co.....West-Troy, N. Y.
Kimball Manufacturing Co.....San Francisco, Cal.
Keith, H. T. & I. N .....W. Sandwich, Mass.
Laporte Car Manufacturing Co.....Laporte, Ind.
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Lehigh Car Manufacturing Co.....Stemton, Pa.
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Myers, H. S. & Co. (small cars).....York, Pa.
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Niblo, James M.....Conshohocken, Pa.
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Ohio Falls Car Co..... .....Jeffersonville, Ind
Ontario Car Co..... .....London, Ont.
Oxford Co-operative Car Co..... .. ..Oxford, Pa.
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Star Mining & Manufacturing Co.....Henderson, Ky.
Taunton Car Co.....Taunton, Mass
Tredegar Co ....Richmond, Va.
Tiffin Car-Works.....Tiffin, Ohio.
Vigo Foundry and Terre Haute Car-Works Terre Haute, Ind.
Watsontown Car Co.....Watsontown, Pa.
Wharton, Thomas J.....Brunswick, Ga.
Whittaker, Phillips & Co..... .....Toledo, Ohio.
Wason Manufacturing Co.....Springfield, Mass
Weimer, P L & Bros.....Lebanon, Pa.
Wyoming Valley Manufacturing Co... ...Wilkesbarre, Pa.
Wells, French & Co..... ...Chicago, Ill.
Wilmington Car-Works.....Wilmington, Del.

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Albany Car-Wheel Works.....Albany, N. Y.
American Paper Car-Wheel Co.....Hudson, N. Y.
Atlantic Iron-Works ....Portsmouth, Va.
Baltimore Car-Wheel Foundry Co.....Baltimore. Md.
Barnum & Richardson Manufacturing Co..Chicago, Ill.
Barney & Smith Manufacturing Co. .....Dayton, Ohio.
Bass & Hanna..... ... Fort Wayne, Ind.
Bailey, Howson & Co.....St. Paul, Minn.
Blanchard & Arnold.....Milwaukee, Wis.
Boston Car-Wheel Co.....Camb'gep't, Mass.
Bowler, Mayer & Brayton..... ...Cleveland, Ohio.
Chicago Car-Wheel Co.....Chicago, Ill.
Davenport, Fairbairn & Co..... .....Erie. Pa.
Dawson Manufacturing Co.....Dawson, Ga.
Detroit Car-Wheel Works.....Detroit, Mich.
Fulton Foundry Co.....Cleveland, Ohio.
Gill, John L. Jr..... .. ..Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co....St. Louis, Mo.
Hamtramck Car-Wheel Works.....Detroit, Mich.
Haskell & Barker Car Co .....Michigan City, Ind.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Heartt, Jonas S. & Co.....Troy, N. Y.
Jackson & Woodin.....Berwick, Pa.
John L. Gill. .....Columbus, Ohio.
Lehigh Car-Wheel & Axle Works.....Catasauqua, Pa.
Lobdell Car-Wheel Works.....Wilmington, Del.
London Car-Wheel Co..... .....London, Can.
Louisville Car-Wheel & Railway Supply Co...Louisville, Ky.
Middlebrook & Mack..... .....Oswego, N. Y.
Missouri Car and Foundry Co.....St. Louis, Mo.
Mowry Car and Wheel Works..... .Cincinnati, Ohio.
Ohio Falls Car Co..... ....Jeffersonville, Ind.
Pettengill, Glass & Co.....Cleveland, Ohio.
Quealey, W. J... ....Hannibal, Mo.
Ramapo Wheel & Foundry Co.....Ramapo, N. Y.
Russell, B. F. & Co .... Chicago, Ill.
Rutland Foundry & Machine Co.....Rutland, Vt.
Sterling Car-Wheel Foundry.....Columbus, Ohio.
Scoville, J. & N. C.....Buffalo. N. Y.
St. Louis Car-Wheel Co. ....St. Louis, Mo.
Taylor Iron Works.....High Bridge, N. J.
Thompson, Duglas..... Bordentown, N. J.
Tredegar Company..... .....Richmond, Va.
Toronto Car-Wheel Co..... .....Toronto, Can.
Washburn, Hunts & Co.....Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co.. ..Worcester, Mass.
Wason Manufacturing Co.....Springfield, Mass.
Whitney A. & Sons.....Philadelphia, Pa.
Woodbury & Company..... .....E.Cambr'ge, Mass.
Wyoming Valley Manufacturing Co.....Wilkesbarre, Pa.

Locomotive Builders.

Baldwin Locomotive Works .....Philadelphia, Pa.
Brooks Locomotive Works .....Dunkirk, N. Y.
Danforth & Cooke.....Paterson, N. J.
Dawson & Baily (light locomotives).....Connellsville, Pa.
Dickson Manufacturing Co..... .....Scranton, Pa.
Grant Locomotive Works.....Paterson, N. J.
Hinckley Locomotive Works.....Boston, Mass.
Manchester Locomotive Works.....Manchester, N. H.
Mason, William.....Taunton, Mass.
McKay Iron and Locomotive Works.....Jersey City, N J.
Portland Company.....Portland, Me.
Porter, Bell & Co. (light locomotives)... ...Pittsburg, Pa.
Pittsburg Locomotive Works.....Pittsburg, Pa.
Rogers Locomotive Works.....Paterson, N. J.
Rhode Island Locomotive Works..... ....Providence, R. I.
Schenectady Locomotive Works.....Schenectady, N. Y.
Taunton Locomotive Works.....Taunton, Mass.

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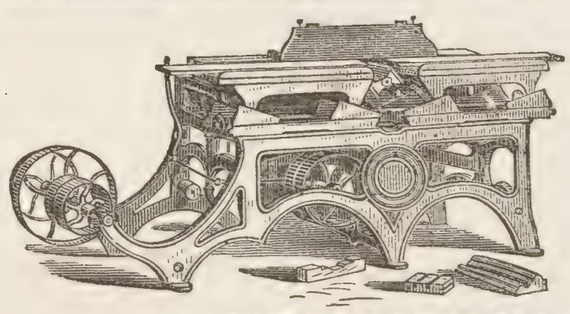

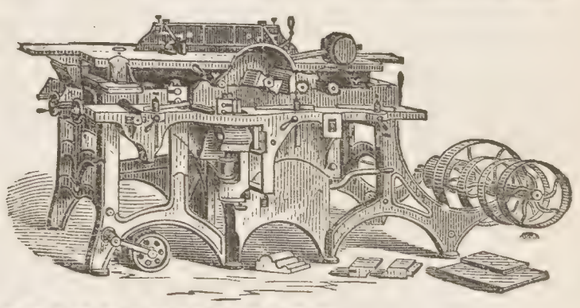

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Albany & Susquehanna	R. C. Blackall	R. C. Blackall	Albany, N. Y.
Alexandria & Fredericksburg			Alexandria, Va.
Alexandria, Nebraska & Iowa	Geo. Q. Adams		Alexandria, Mo.
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Atchison & Nebraska	Selah Williams		Atchison, Kan.
Alabama & Chattanooga	T. H. Kennedy		Chattanooga, Tenn.
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Atlanta & West Point		R. D. Cole	Newnan, Ga.
Atlantic & Gulf	C. E. Van Vorst	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
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Atlantic & Great Western	William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Haggard	Cleveland, Ohio.
Atlantic & Great Western	‖J. B. Miller.	S. V. Smith	Kent, Ohio.
Atlantic & Great Western	Allen Cook.	J. W. Holmes	Galion, Ohio.
Atlantic & Pacific	§John Hewitt	E. Martin	St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South-Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
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Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack.	Baltimore, Md.
Baltimore & Ohio		James H. Miller	Baltimore. Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott		Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
Central Ohio Division	Alex. Platt		Zanesville, Ohio.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, Ohio.
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Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe.	H. D. Landis	H D. Landis	Bellefonte, Pa.
Belvidere Delaware.	R. McDowell	John Silvers	Lambertville, N. J.
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Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W.E.Chamberlain.	Allston, Mass.
Boston, Barre & Gardner	John Loyer		Worcester, Mass.
Boston & Providence	George Richards.	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg. Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D C. Richardson.	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston. Mass.
Boston, Lowell & Nashua		S. A. Davis.	Nashua. N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Blue Ridge			Anderson. S. C.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vai		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer.	Jacob Williams	Oil City, Pa.
C			
Cairo & Fulton	L. Finlay	L. Finlay	Little Rock, Ark.
California Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal
Camden & Amboy	F. B Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and branches	‡‡C. E. Benton	††C. E. Benton	St. Thomas, Canada
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis.	Catawissa, Pa
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach	Catasauqua. Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Charleston & Savannah	H. T. Calder		Charleston, S. C
Chesapeake & Ohio	W G. Freeman	J. N. King.	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bossinger	Huntingdon, W.Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S C.
Champlain Trans. Co.	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King.	C. H. Frazer	Columbia, S. C.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Wiscon. Mad. & Mill. Divis			Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender.	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	J. D. Besler	Galesburg, Ill.
Creston Division	Joel West		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch.	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes.	J. B. Morgan	W. H. Dunnam,	Danville, Ill.
Chicago & Canada Southern	§§J. Johann		Trenton. Mich.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Divison	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen	W. H. H. Allison	Cincinnati. Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gorse		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster. Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M.W. Dickerman.	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford. Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passampsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	J. W. Sauerbach	Mt Savage, Md.
Central of Georgia	D. D. Arden	C. C. Millar.	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div.	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific.			Atchison, Kansas.
Central R. R of Iowa	F. B. Woodruff	T. L. Seevers	Marshall, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
D			
Dakota Southern	Jas Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury. Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison.	Cincinnati. Ohio
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa
Morris & Essex Division	W. H. Lewis	L S. Barber	Hoboken, N. J.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit. Mich.
Detroit. Lansing & Lake Michigan.	Tho. G. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co	James Dickson	Thomas Orchard.	Carbondale, Pa.
Rensselaer & Saratoga Div			Troy. N. Y.
Dorchester & Delaware			Cambridge. Md.
Dubuque South-western	James Rollo	James Rollo	Farley. Iowa.
Dutchess & Columbia	W. G.Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L Weaver	Riverton, Ky.
East Tennessee & Virginia.	Eli Hixon	Jos. Armbruster	Knoxville. Tenn.
East Tennessee & Georgia.	Eli Hixon		Knoxville, Tenn.
East Pennsylvania		Samuel Reeves	Reading, Pa
Elizabethtown and Paducah	W D. Robb	T. A. Cordrey	Elizabethtown, Ky.
Erie Railway.	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna. Pa.
Erie Railway.	‖V. Blackburn		Jersey City. N. J.
Erie Railway	‖F. M. Wilder.	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E. Cooper	W. E. Cooper	Hornellsville, N. Y.
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler.	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge.	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio.	Jno. G. Coulon		Galveston, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk	Warren Noyes		Gorham, Me.
Grand Trunk	†Richard Eaton	J. W. W. McWood.	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Sol. Bills	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman.	T. M. Preval.	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland. Vt.
Harlem Extension.		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H. L Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	W. W Coller	M. Tellerhoof	Saxton. Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith.	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes.	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams.		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo. Iowa.
Iron	Perry Scott.	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. T. Sanford	R. B. More.	Mattoon. Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Keokuk & Des Moines Valley	Jas. Lamb	R. E. Smith	Keokuk, Iowa.
Knox & Lincoln.	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	J. P. Pringle		Denver, Col.
Kansas Pacific	**L. H. Waugh.		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H Waugh.		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff.	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas.	Chester, S. C.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson.	C.A.Thompson	Hunter's Point, L.I.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
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Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo. N. Y.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River. Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John E lis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Macon & Western	D. M. Gogul	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H
Marietta & Pittsburg	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	M. Thornton	M Thornton	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio
Memphis & Little Rock	Tho. Rennells	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis. Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Mississippi Central	Henry Gibbon	John E. Becton	Water Valley. Miss
Maryland & Delaware	Samuel Peters		Greensboro, Md
Midland Pacific			Nebraska City, Neb
Milwaukee & Northern		W. J. F. Liddell	De Pere. Wis.
Milwaukee & St. Paul	T. S. Davis	Wm. E. Kittredge	Milwaukee, Wis.
Milwaukee & St. Paul		John Baillie	Milwaukee. Wis.
Milwaukee & St. Paul	J. Pattee	D. F. Wilson	Minneapolis. Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
J'kson, Lans'g & Saginaw Div.			Jackson Mich.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard. Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	B. S. Skates	I. T. Booth	Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven. Ct.
New-Jersey Midland	C. J. Clifford.		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem.	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan.	E A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y.
New-York & Oswego Midland	‖Wm. H. Griggs	Wm. H Griggs	Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven. Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, Jackson & Gt. Northern.	N. Greener	N. Greener	New-Orleans. La.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Northern	James W. Lander	Albert Langmaid	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport	J. K. Taylor	A. Gleason	Boston. Mass.
Oil City & Pithole	George Thompson		Pithole, Pa
Oil Creek & Alleghany River	H.J. Bookhammer	Jacob Williams	Oil City, Pa.
Oil Creek & Alleghany.	H.J. Bookhammer.	John Monks	Oil City, Pa
Ohio & Mississippi		G. Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott	Chas. Hyatt	East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	J. D. Linning		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	John Hewitt	St Louis, Mo.
Pennsylvania	§§Frank Thomson		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	James F. Elder	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Ches[illegible] Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis			
Pittsburg & Columbus Division	E. Pierce		Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Pendleton, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns		Connellsville. Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	C. W. Furber	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G Taylor	H. G Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village N H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L Driscoll	Jerry Wigg	Poughkeepsie, N. Y

Q

Quincy, Alton & St. Louis	J. O. Grav l	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.

R

Raleigh & Gaston.			Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	H. Longest	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome. N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome. Ga.
Rochester & Genesee Valley.	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame	Prescott, Canada.
St Louis & Iron Mountain	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	A. P. Doane	A P Doane	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells. Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M.Gogul	James A. Knight	Macon. Ga.
South Shore	Warren E. Ray		Cohasset. Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo. C. E.
Seaboard & Roanoke	§A. Pendleton		Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Daughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Maynes	W W. Peirce	Selma. Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E.Granger		Springfield, Mass.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N. Y.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.

T

Taunton Branch.	W. M. Parks	J. G. Codding	Taunton, Mass
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans	R. B. Baer		Houston. Texas.
Texas & Pacific	W. H. Hipple		Marshall, Texas
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn
Toledo, Wabash & Western	**G. W. Cushing	‖J. B. Morse	Fort Wayne, Ind
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	‖James King		Springfield, Ill.
Toledo, Wabash & Western		‖U. H. Kohler	Toledo. Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha. Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Edward Cox	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vicksburg & Brunswick	James Boon	J. A. Knight	Eufaula, Ala.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	W. H. Turrintine.	W. J. Calais	Wilmington, N .C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia. Pa.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Coatesville, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Western R. R. N. C.	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Albany, N. Y.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J. N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H. Eaton	Bangor, Maine.
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & Fulton	J. H. Morley	W. H. Hallett	Little Rock, Ark.
Cairo & St. Louis	C Hamilton		St. Louis, Mo.
Cairo & Vincennes	L. W. Palmer		Cairo, Ill.
Camden & Atlantic	E. Collings		Camden, N. J.
Canada Sonthern	*J S. Casement		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Sacramento & Oregon Division	J. A. Fillmore		Sacramento, Cal.
Western & Visalia Division	E. C. Fellows		Oakland, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humbolt Division	R. S. Mattison		Carlin, Nevada.
Salt-Lake Division	R. H. Pratt		Ogden, Utah.
California & Pacific Division	A D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart		Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡W. B. Strong		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Pekin & Southwestern	N. J. T. Dana		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati,, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron		Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough		Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Akron, Ohio.
Colorado Central	T. E. Sickles		Golden, Col
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E. Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware, Lackawanna & Western	W. F. Halstead	G. W. B. Cushing	Scranton, Pa.
Morris & Essex Division	Andrew Reasmer	G. W. Bleashing	Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese		Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.

E

East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)	J. Prescott	C. W. Pratt	Boston, Mass.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Elizabethtown & Paducah		D. Brock	Elizabethtown, Ky.
Elizabethtown & Paducah	D. F. Whitcomb		Louisville, Ky.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo. N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw, Mich.
Florida Central	F. P. Papy		Jacksonville, Fla.
Flushing & North-Side	I. D. Barton		Hunter's Point, L.I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson		Augusta, Ga.
Gilman, Clinton & Springfield	S. H. Melvin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich
Grand Rapids & Indiana		William Mullins	Pittsburg, Pa.
Grand Trunk		John Taylor	Montreal, Canada.
East Division	Henry Bailey		
West Division	W. J. Spicer		
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell		Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	S. Conant		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis	Horace Scott	Wm. Mullins	Pittsburg, Pa.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Pacific	Edward S. Bowen		Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H Briggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Combs	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound	G.W. B.Cushing	Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. H. Grant	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Lake Shore & Michigan Southern	Charles Paine	A. C Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	E. O. Foote, Jr	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
	L. Chamberlin		Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	J. C. Hadley		Terre Haute, Ind.
Long Island	L. D Morford	Oliver Charlick	Hunter's Point, L. I.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Robert Meek		Clarksville, Tenn.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	M. Stanton		Birmingham, Ala.
Louisville, Cin. & Lexington	George Skinner	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	M. Sloat	J. R. Parker	New-Albany, Ind.

M

Macon & Brunswick	William McRae	Solomon Hass	Macon, Ga.
Maine Central	L. L Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta & Pittsburg	A. J. Warner	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	C. E. Van Cleve	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	A. S. Livermore		Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	H. E. Sargent		Detroit, Mich.
Michigan Central		John Newell	Detroit, Mich.
Grand River Valley Division	Chas. Desmond		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	Geo. C. Hopper		Saginaw City, Mich.
South-Haven Division	Geo. E. Curtiss		Kalamazoo, Mich.
Jolict Division	Carlton Wheeler		Joliet, Mich.
South-Bend Division			
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse		Lincoln, Neb.
Milwaukee, Lake Shore & Western	W. Elwell		Sheboygan, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Milwaukee & St. Paul	*S. S. Merrill	Rob't Wason	Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mississippi Central	R. N. Colquhoun.		Water Valley, Miss.
Mississippi Central	*E. D Frost	S. H. Edgar, V. P.	New-Orleans, La.
Mississippi & Tennessee	M. Burke	M. Burk	Memphis, Tenn.
Mississippi Valley & Western	E. P. Buell		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	F. W. Bowen	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Hamilton		Parsons, Kansas.
Choctaw Division	S. G Eddy		Holden, Mo.
Eastern Division	Mark M. Towne		Hannibal, Mo.
Sedalia Division	Mark M. Towne		Sedalia. Mo.
Neosho Division	L. S. Hamilton.		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Heaning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	L. J. Fleming	C. E. Rushing	Mobile, Ala.
	Cecil Fleming		Mobile, Ala.
	E. S. Hosford		Macon, Miss.
	M. M. Miller		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.

N

Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart	Tho. H. Little	St. Andrews, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury.	W. A. Waterbury	Middletown, Ct
New Jersey Midland	W. E Lewis		Wortendyke, N. J.
New-Jersey Southern	M. W. Serat		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, Jackson & Great Northern	*E. D. Frost	S. H. Edgar.	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson.		Hartford, Ct.
Shore Line Division	W. M. Wilcox		New-Haven, Ct.
New-York, Boston & Montreal	C L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest.	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo. N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M Andrews.		Worcester, Mass.
New-York & Oswego Midland.	C. W. Douglas	P. Bundy	New-York, N. Y.
New-Jersey Division	G. W. N. Custis.		Jersey City, N. J.
Middle Division	H. M. Flint.		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed.		Rondout, N. Y.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead.	E. T. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division.	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon.		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	J. S. Redfield		Harrisburg. Pa.
Northern (New-Hampshire)	George E. Todd.		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.

O

Ohio & Mississippi	E. L. Ryder.		Cincinnati, Ohio.
Oil Creek & Alleghany River	J. J. Lawrence		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.

P

Paducah & Memphis	J. W. Wilber.		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	G. Clinton Gardner.		Altoona, Pa.
Pennsylvania		Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black.		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	W. H. Brown		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pensacola & Louisville	L. H. Sellars		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Williamsport, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin.		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis.	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Blair		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
Pittsburg & Cin. Division	Hugh Pitcairn		Pittsburg, Pa.
Little Miami Division	J. D Ellison.		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft Wayne & Chicago	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
Eastern Division	Richard Wiggin		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	S. C. Millett		Port Royal, S. C.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner.	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase.		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y.
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.

Q

Quincy, Alton & St. Louis	N. D. Munson	D. A. Sweet	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.

R

Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw.		Richmond, Va.
Rockford, Rock Island & St. Louis	R. R. Cable		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.

S

St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lineoln	J F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute.	W. G. Broughton		St. Louis, Mo.
St. Louis & Iron Mountain	Arthur W. Soper.	W. S. Cuddy	St. Louis, Mo.
St. Louis & Iron Mountain	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. W. Gardiner	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	A. E. Shrader		Henderson, Ky.
St. Louis, Kansas City & Northern	W. C. Van Horne.	R. W. Green	St. Louis, Mo.
St Louis Division	J. L. Hinkley		St. Louis, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson.		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento. Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	E. G. Barney		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Sheboygan, Wis.
Shenango & Allegheny	G. H. McKibbin		Greenville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern			Sodus Point, N. Y.
South-Shore	J. R. Kendrick.		Boston, Mass.
South-Side, Long Island	L. S. Canfield		Brooklyn, N. Y.
South-Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern Minnesota	*H. W. Holley		Wells, Minn.
Southern Pacific of California	A. N Towne		Sacramento, Cal.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield & Ill. South-Eastern.	G. W. Norris		Springfield, Ill.
Staten Island	J. W. Wlbur		New-York, N. Y.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Syracuse Northern	C B. Morse	C. B. Morse	Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing.	Syracuse, N. Y.

T

Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson	C. R. Peddle	Indianapolis, Ind.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble	J. F. Dixon	Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria & Warsaw	W. H. Cruger	Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio.
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
The Great Southern of Ga. & Fla.	M. H. Alberger		Jacksonville, Fla.

U

Union Pacific	T. E. Sickles	T. E. Sickles	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Ill.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City.
Utica & Black River	T. W. Spencer		Utica, N Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.

V

Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
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Western & Atlantic	Wm. McRae		Nashville, Tenn.
Western Maryland	John T. Rigney	John T. Rigney	Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	M. C. Conwell		Wilmington. Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F Devine		Atlanta, Ga.
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Winona & St. Peter	S. Sanborn	J. H. Stewart	Madison, Wis.
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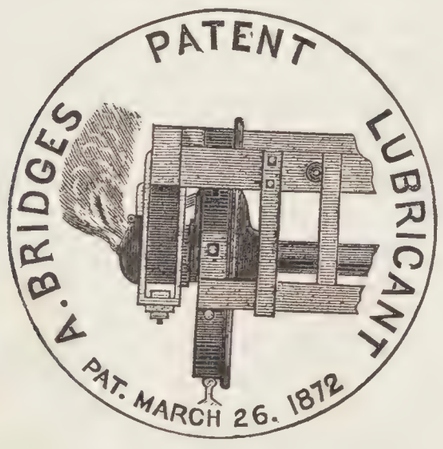

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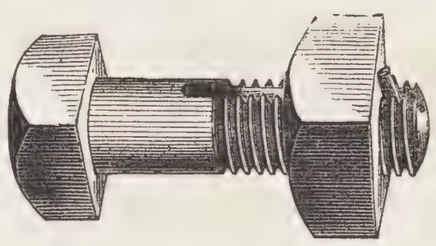
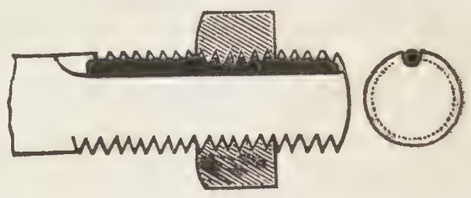


"CUMMING NUT-LOCK,"

Patented

June 16, 1868,

August 23, 1870.



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Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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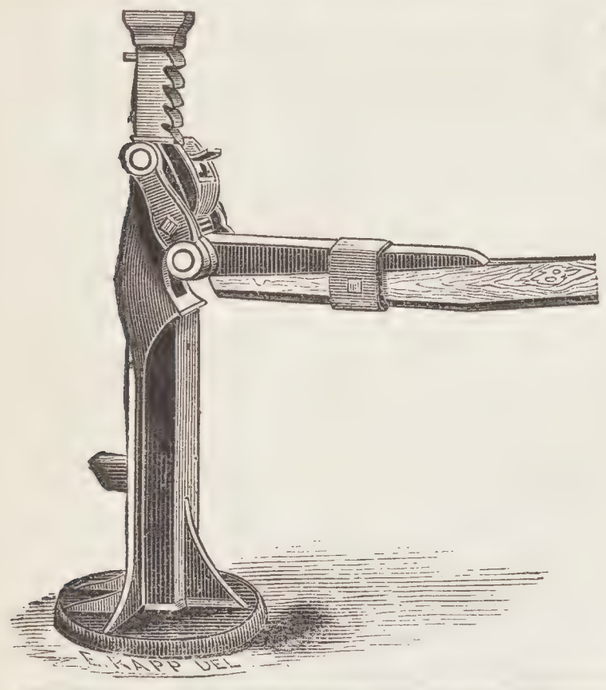

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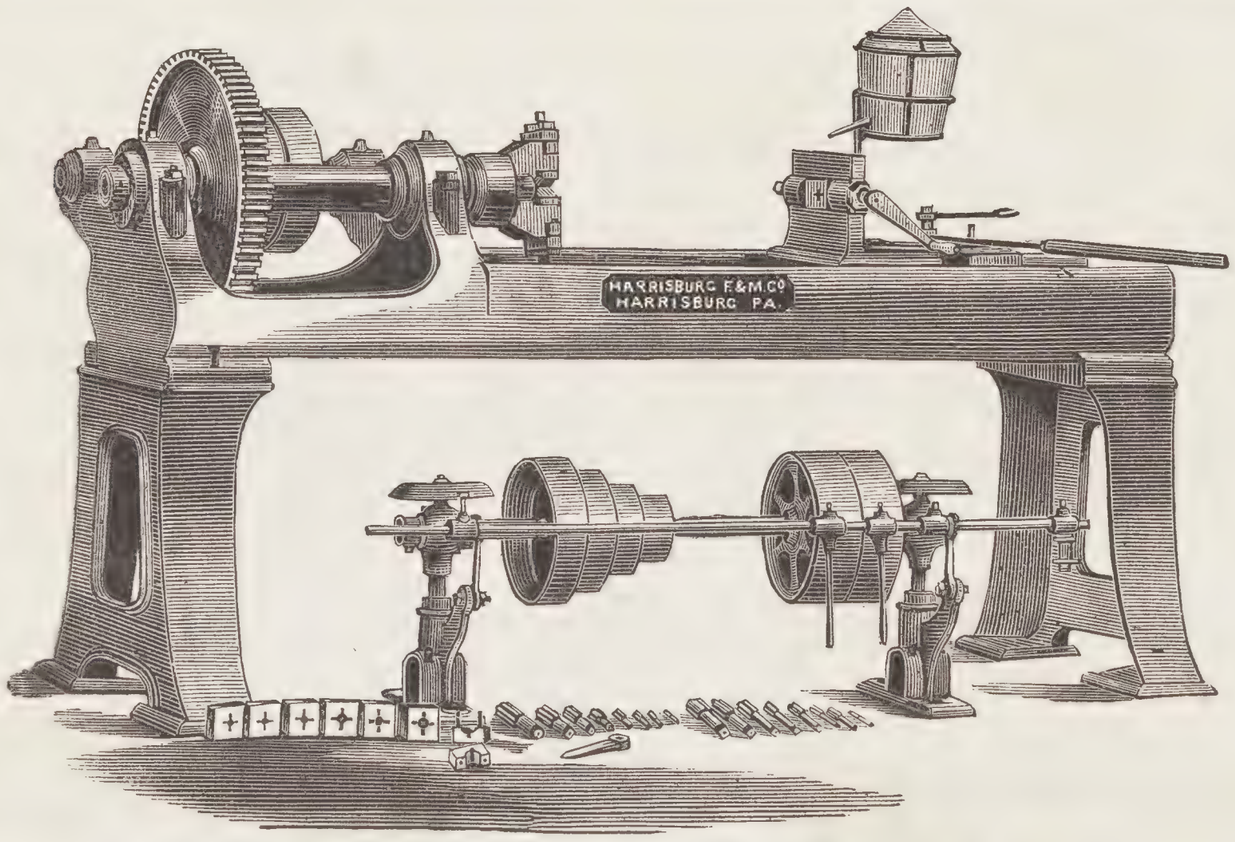

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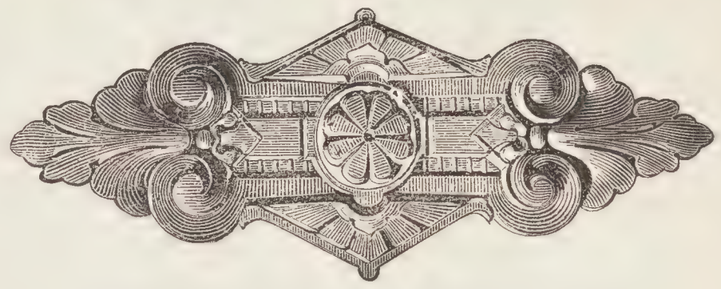

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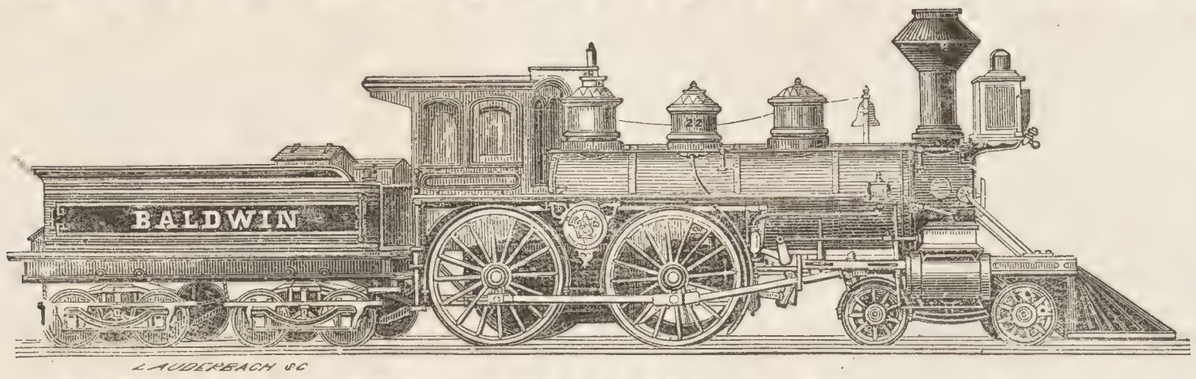

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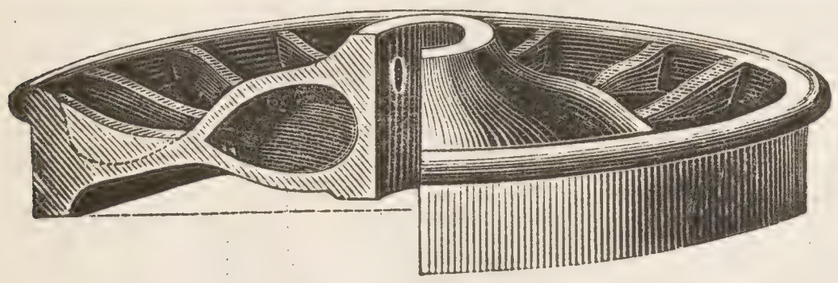

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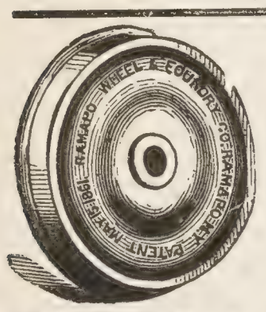

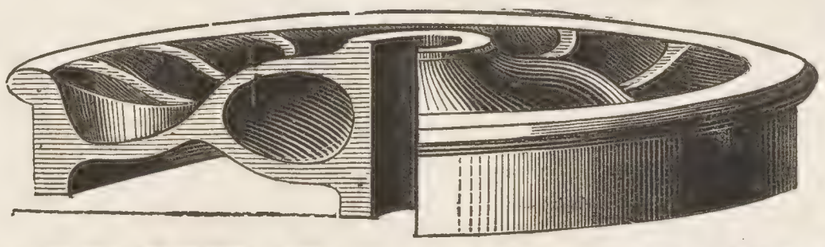

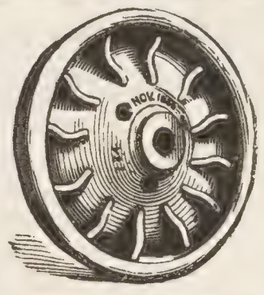

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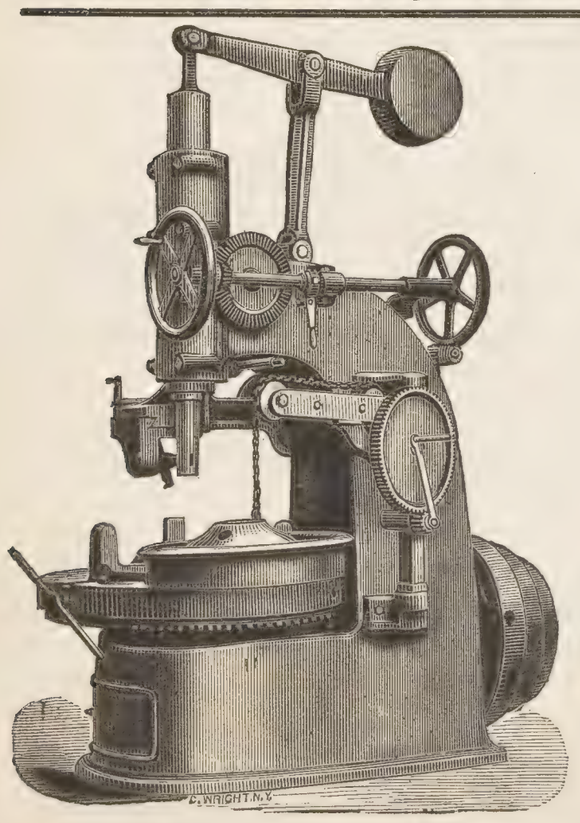

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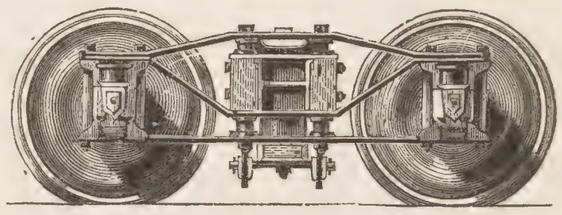

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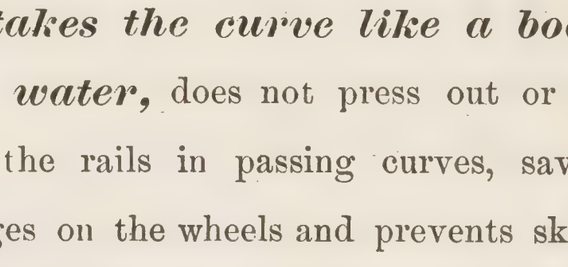

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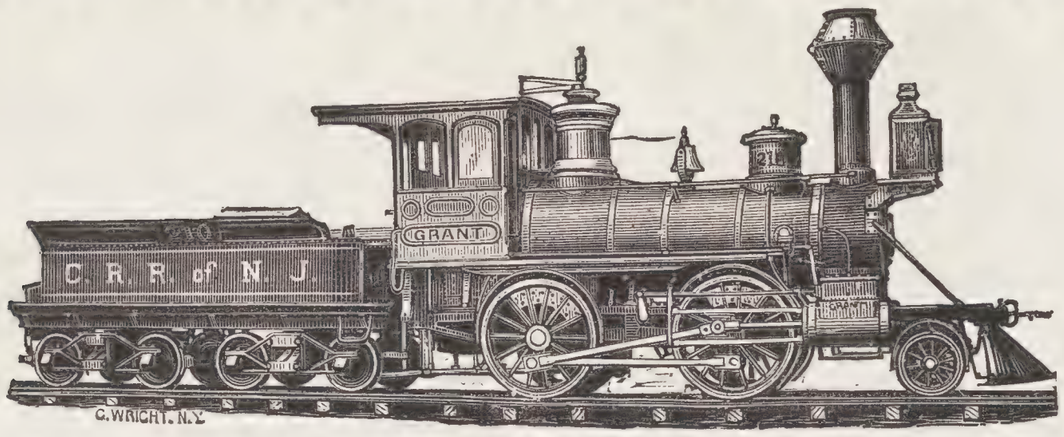

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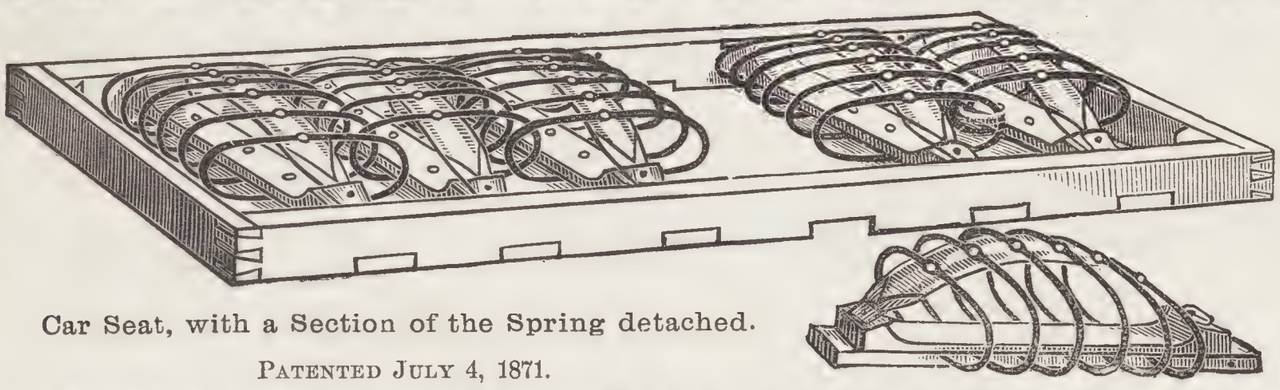

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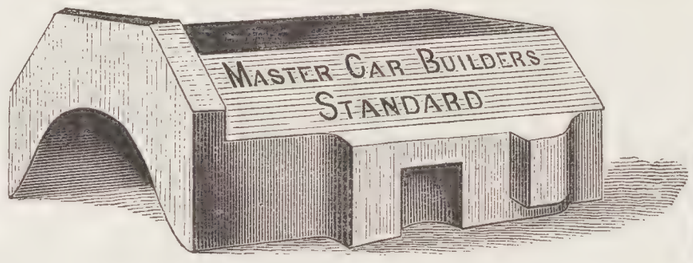

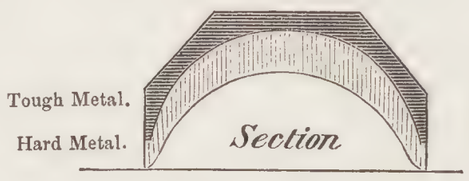

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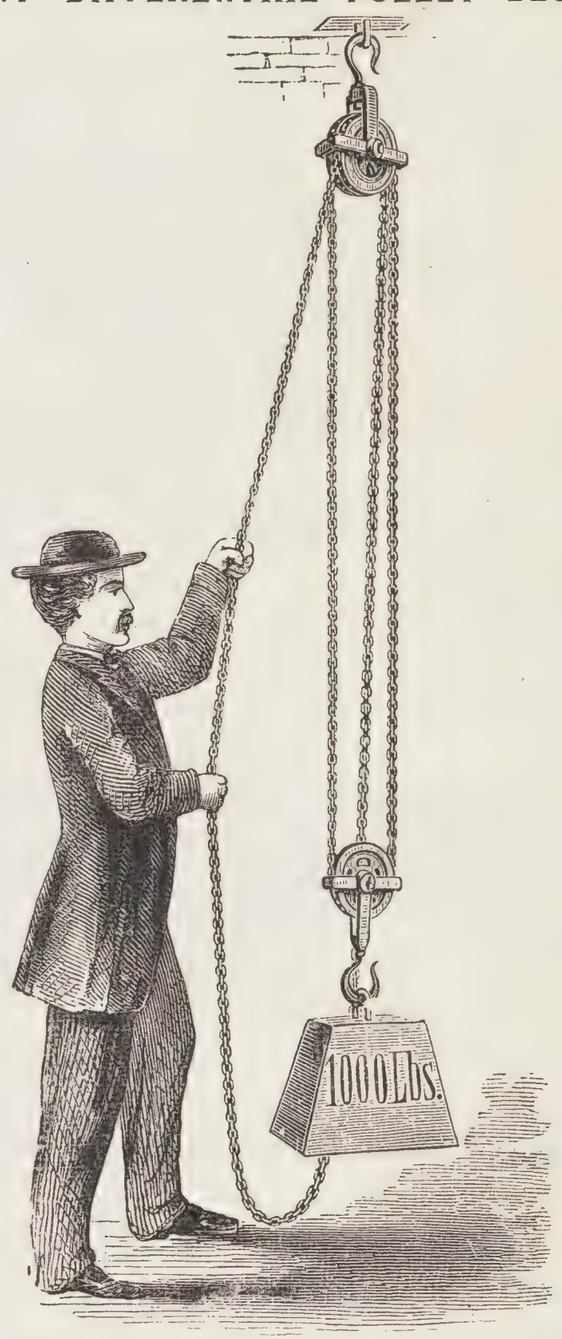

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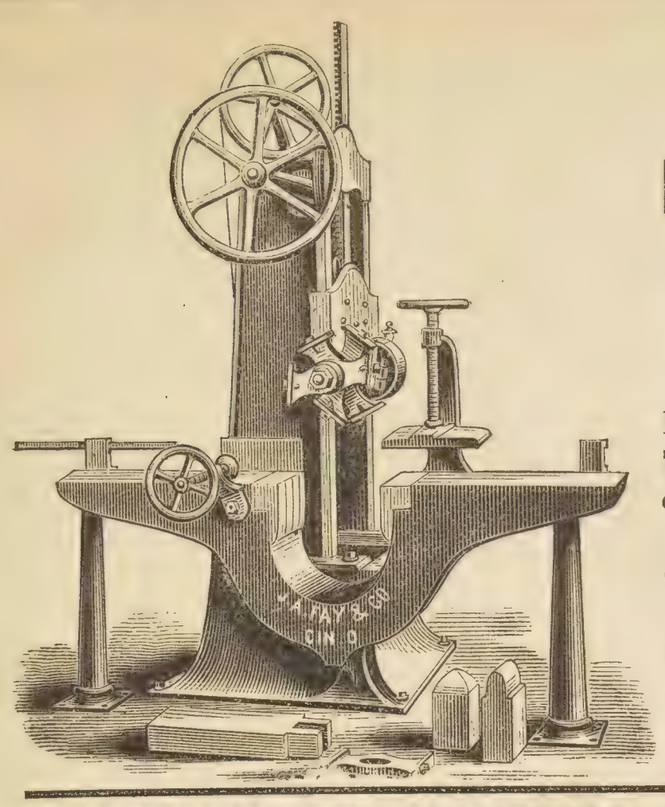

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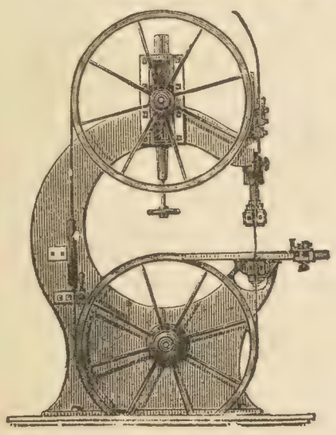

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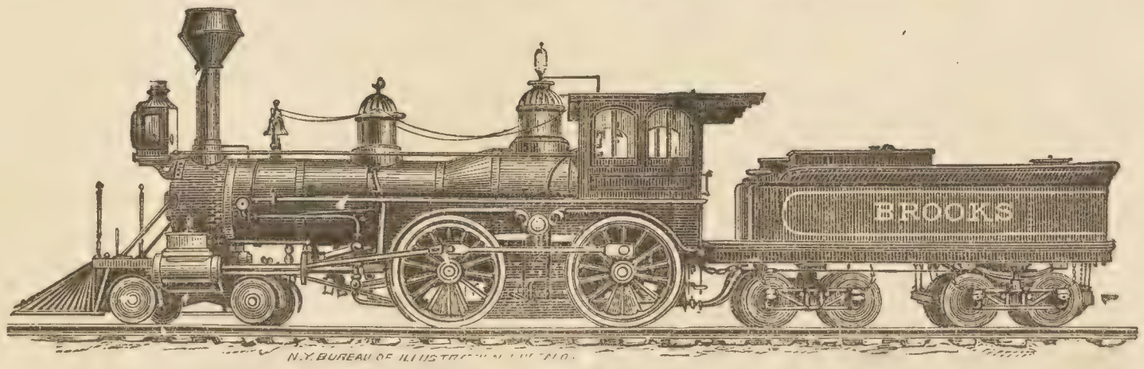

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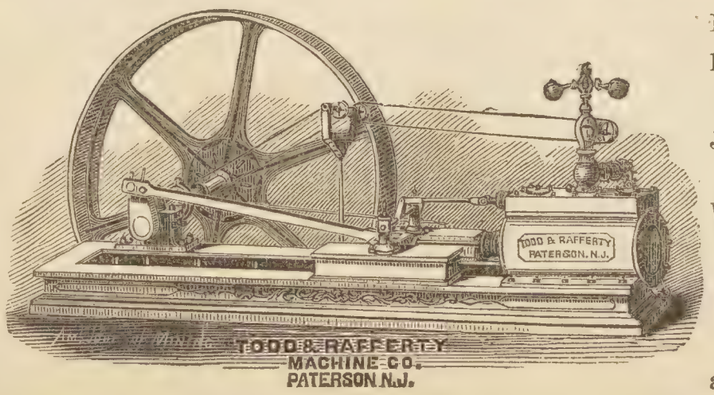

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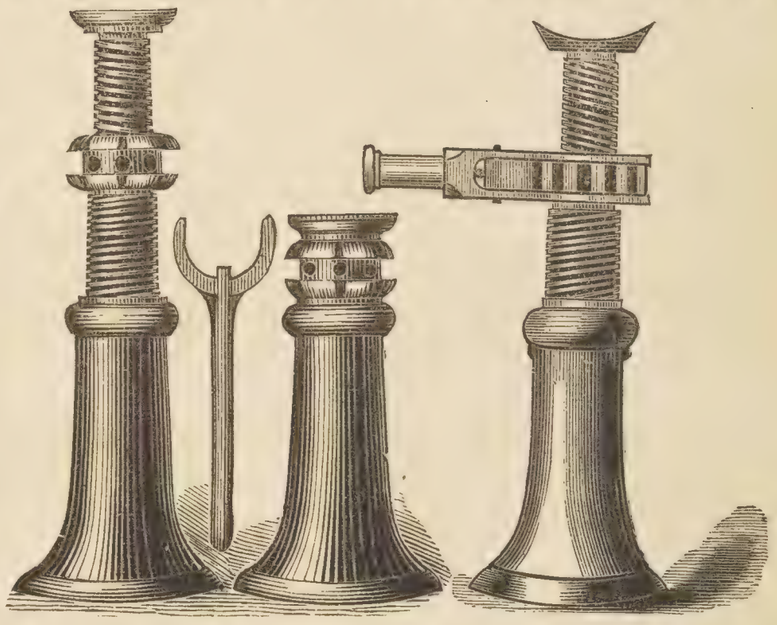

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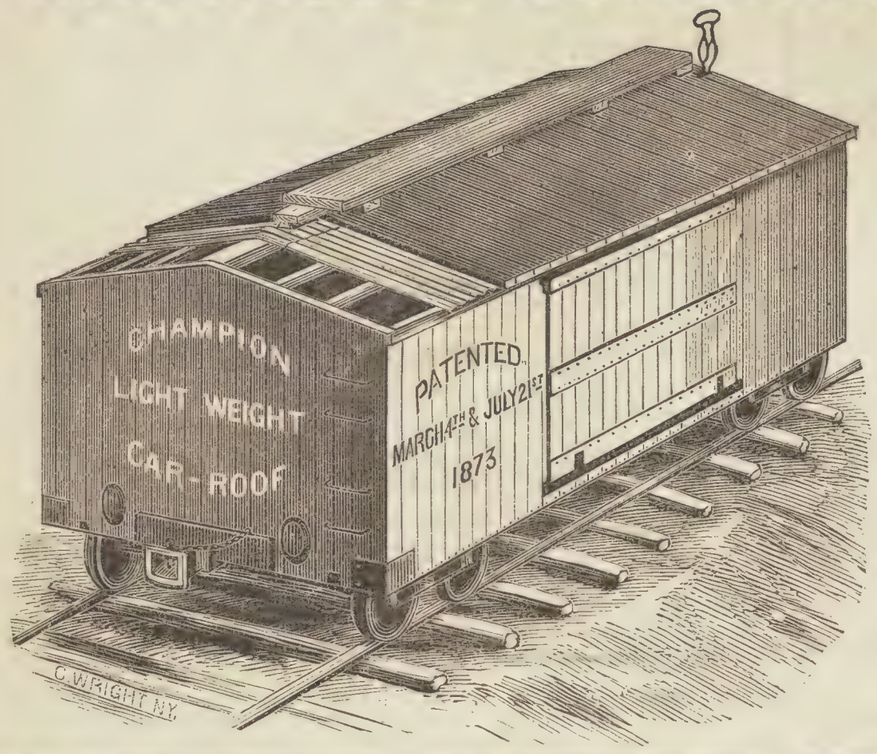

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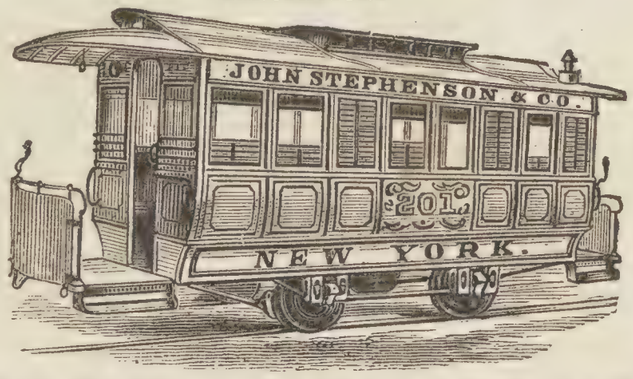

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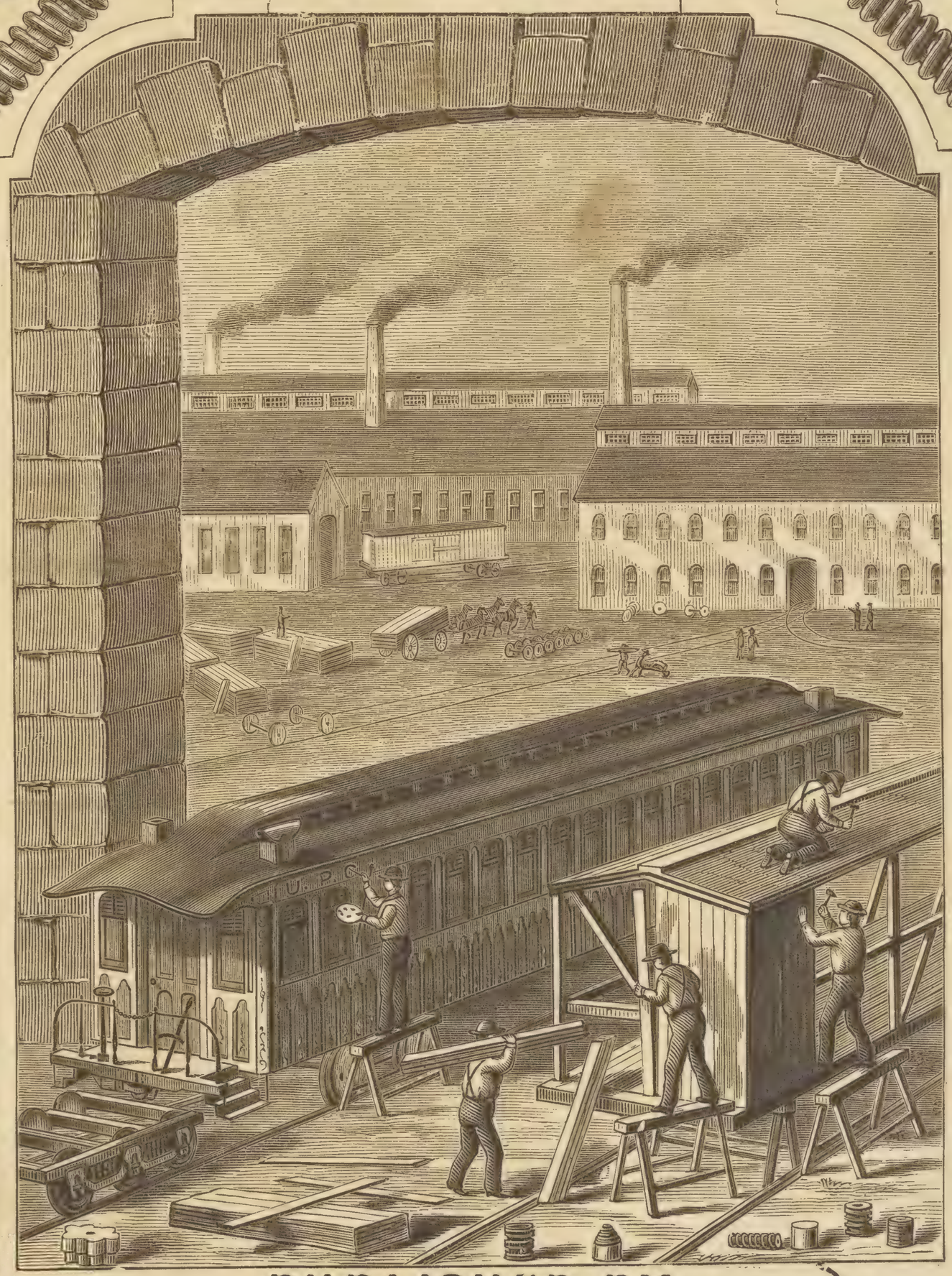

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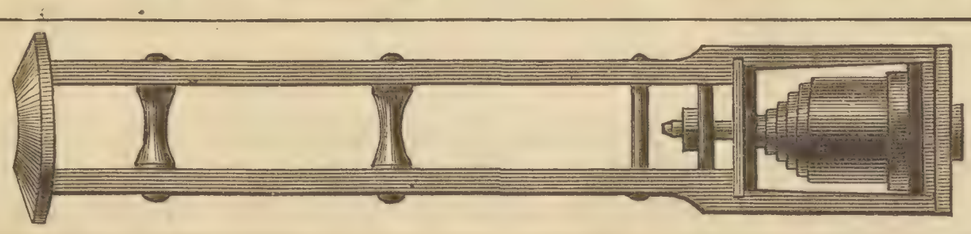

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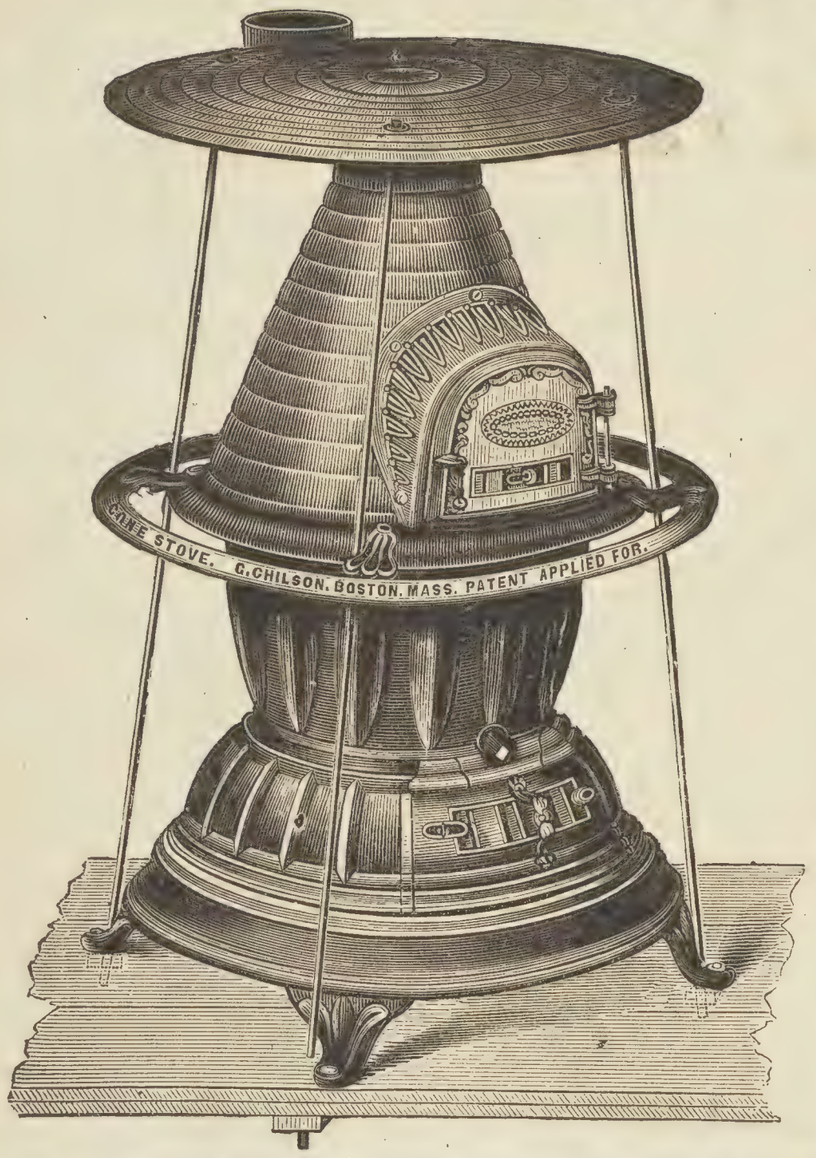

I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

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Yours, etc.,
A. A. FOLSOM, *Superintendent.*

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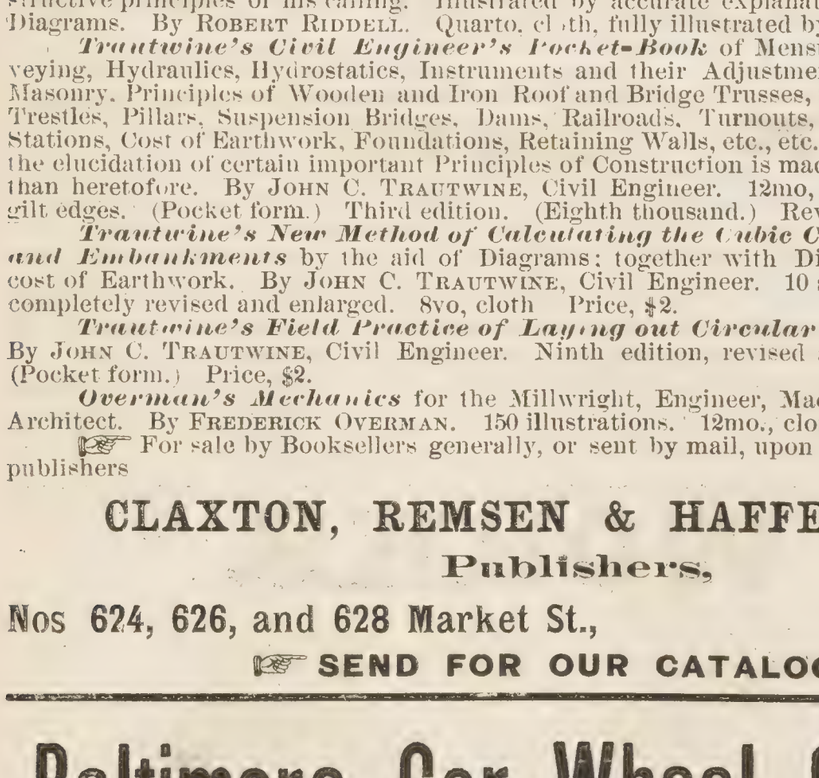

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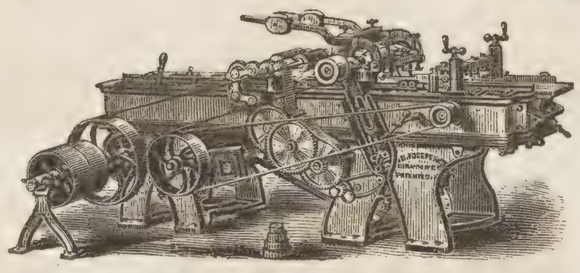

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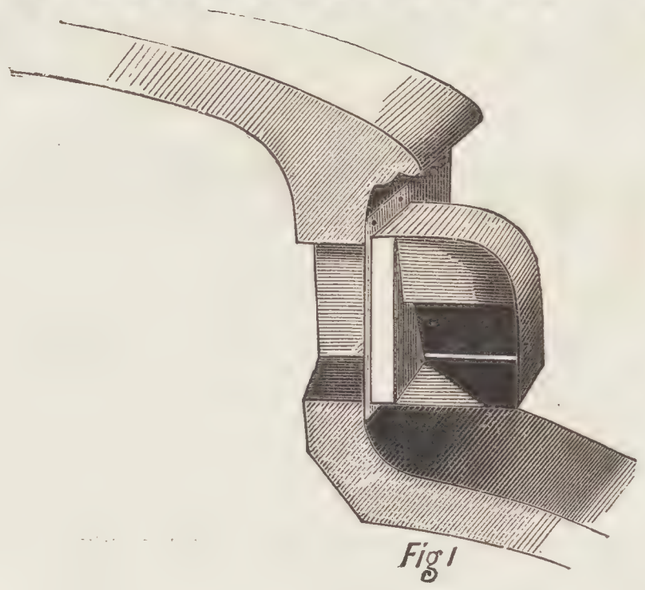

Fig 1

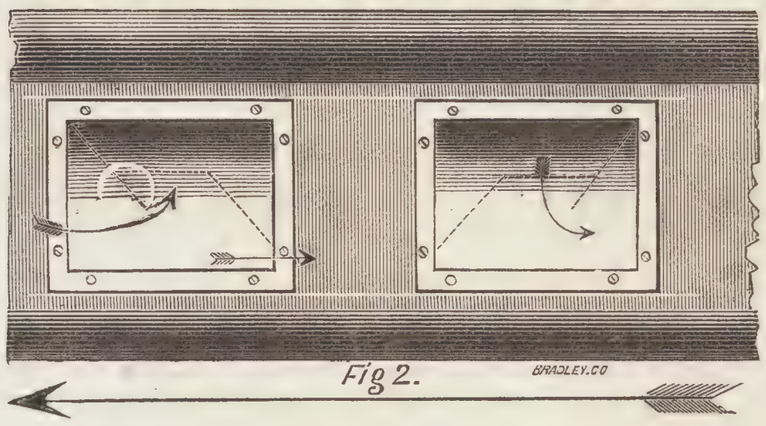

Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is a ways in readiness, and runs itself independent of all employees.

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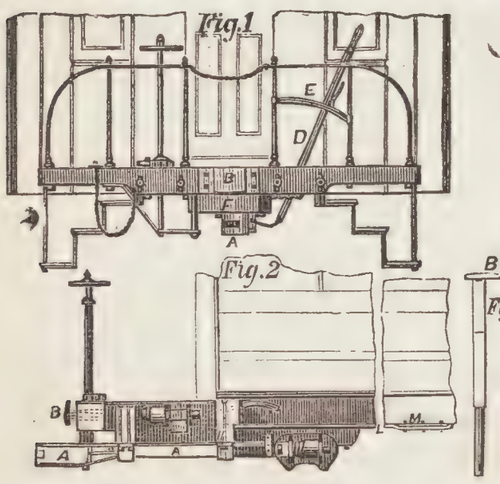
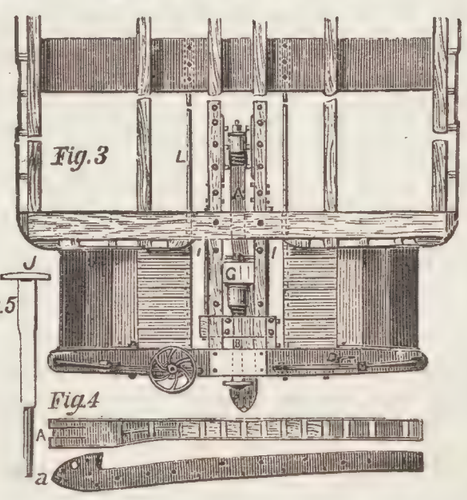
Send for Illustrated Pamphlet, and call and see working models. E. MILLER, Patentee.





DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied: and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

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Are now ready to receive orders for all kinds of

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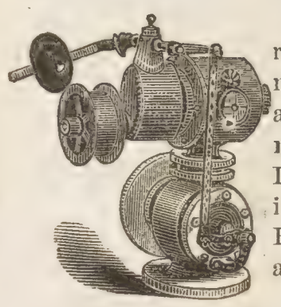

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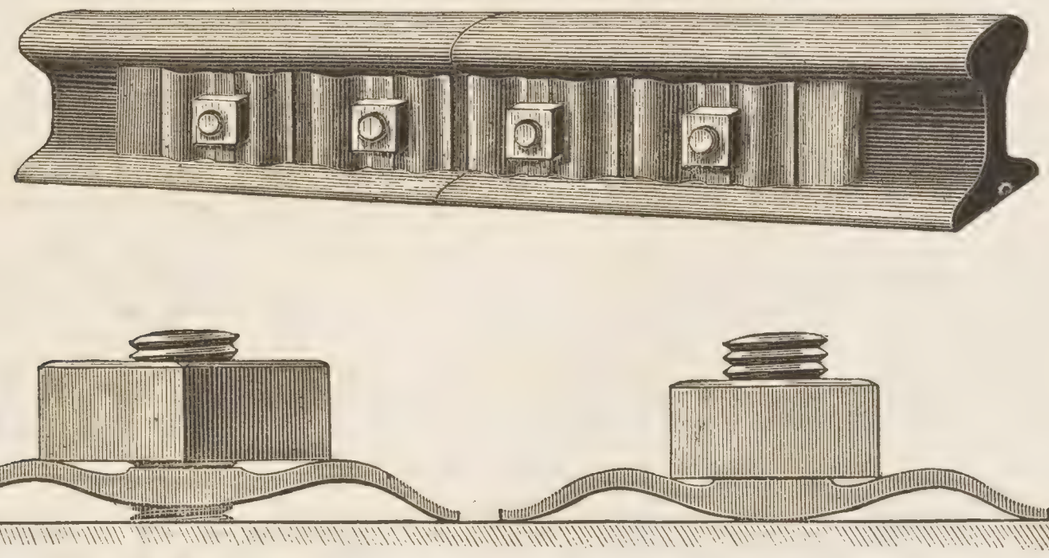
FOR RAILROAD FISH JOINTS.



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These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

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For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.

The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident the eto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

FOR RAILROADS, AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Packing certain quantities of mineral oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather, an element that is lacking in mineral oil. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and mineral oil together. In cold weather, the combination is not so essential, but it will always be found economical to combine a small quantity of the Liquid with the mineral oil which is generally used upon railroads.

Where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes, and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used. We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

BOSTON, LOWELL AND NASHUA R. R. SUPERINTENDENT'S OFFICE,
P. NOYES, AGENT, BOSTON, April 13, 1874.

Dear Sir: We have been using your LIQUID PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent thickening; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Bell and Leather Stuffing Co., CHICAGO, Dec. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C. B. & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING same as purchased of you before, and send as soon as possible.

H. I. HIGGINS, *Purchasing Agent Quincy Railroad.*

CHICAGO, ILL., May 7, 1874.

AGENT BELT AND LEATHER STUFFING CO.:

Dear Sir: You will please forward to the C. B. and Q. R.R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C. B. and Q. R.R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq.: ALBANY, Nov. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report;

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.

JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

Send for a Barrel. No charge unless it does all we state.

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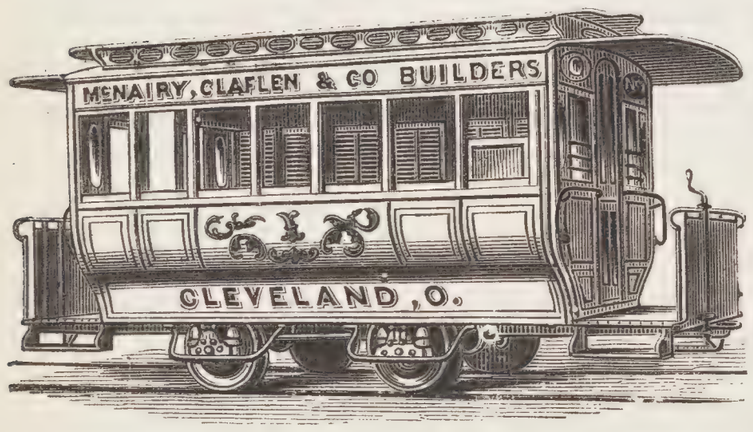

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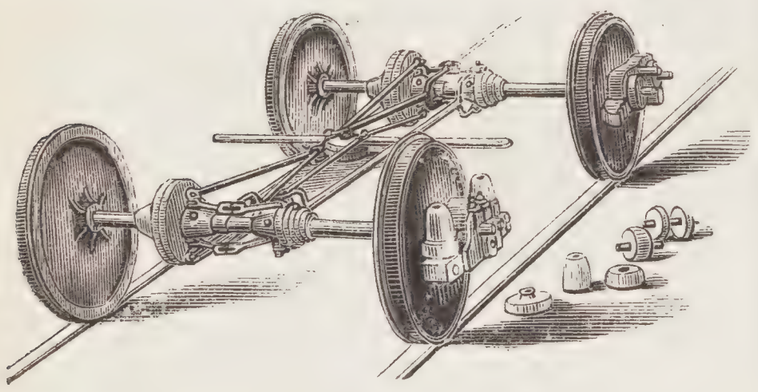

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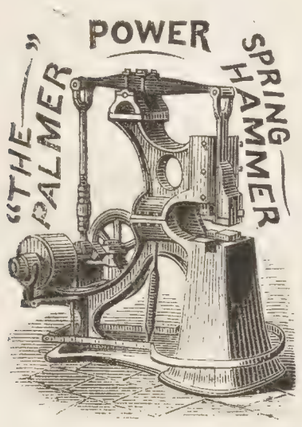

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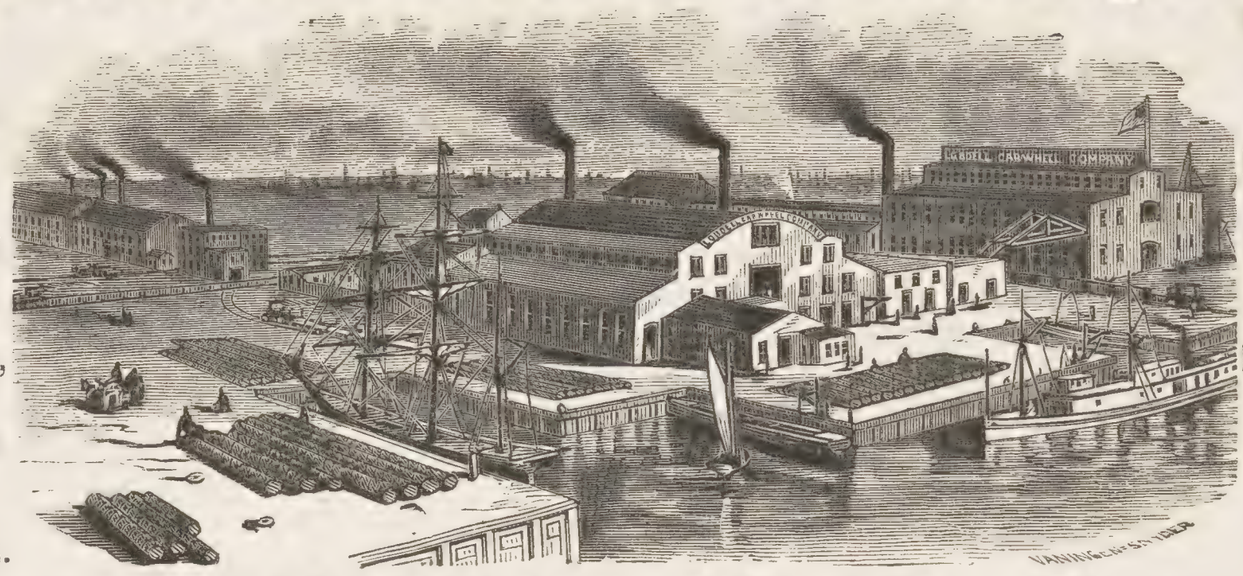

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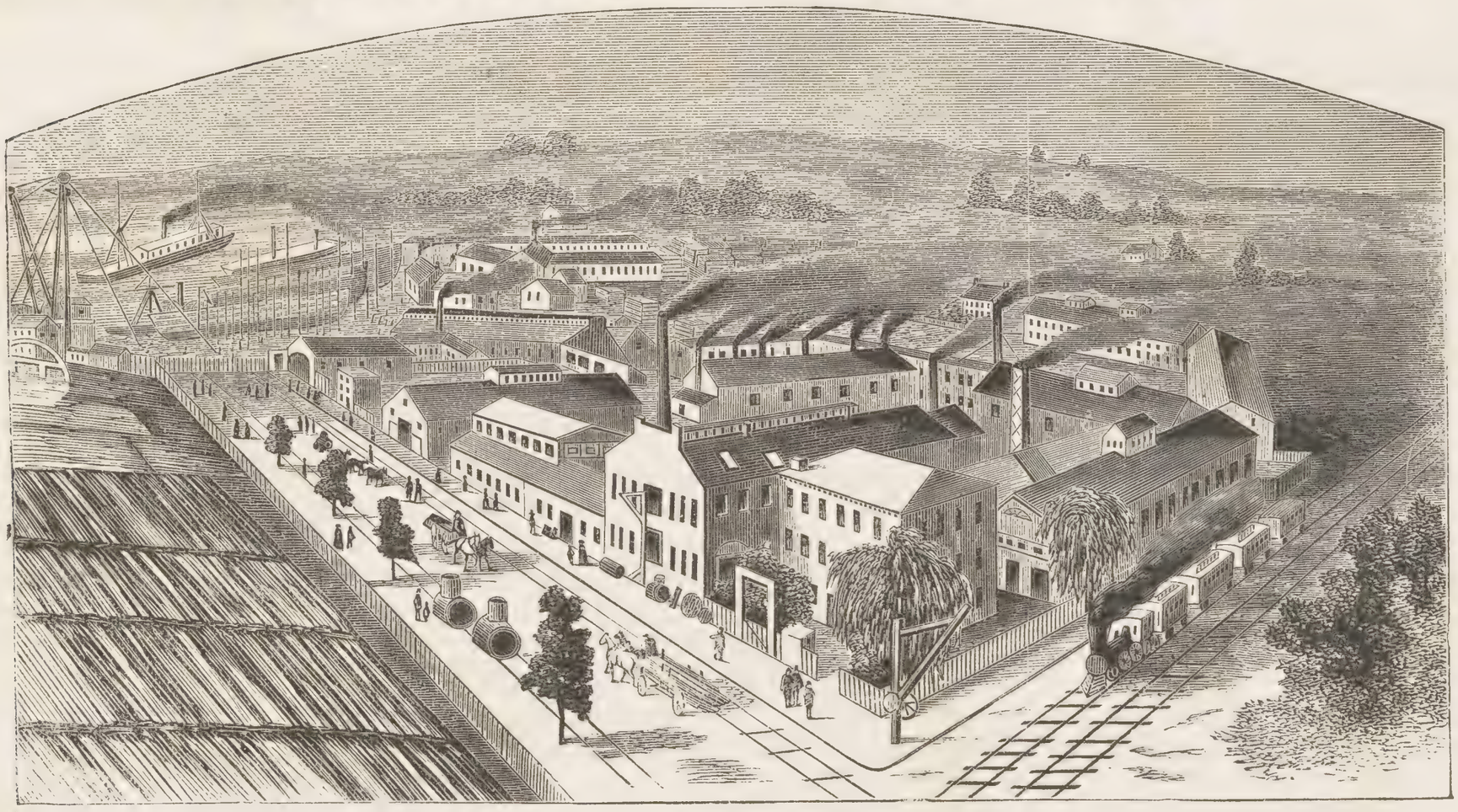

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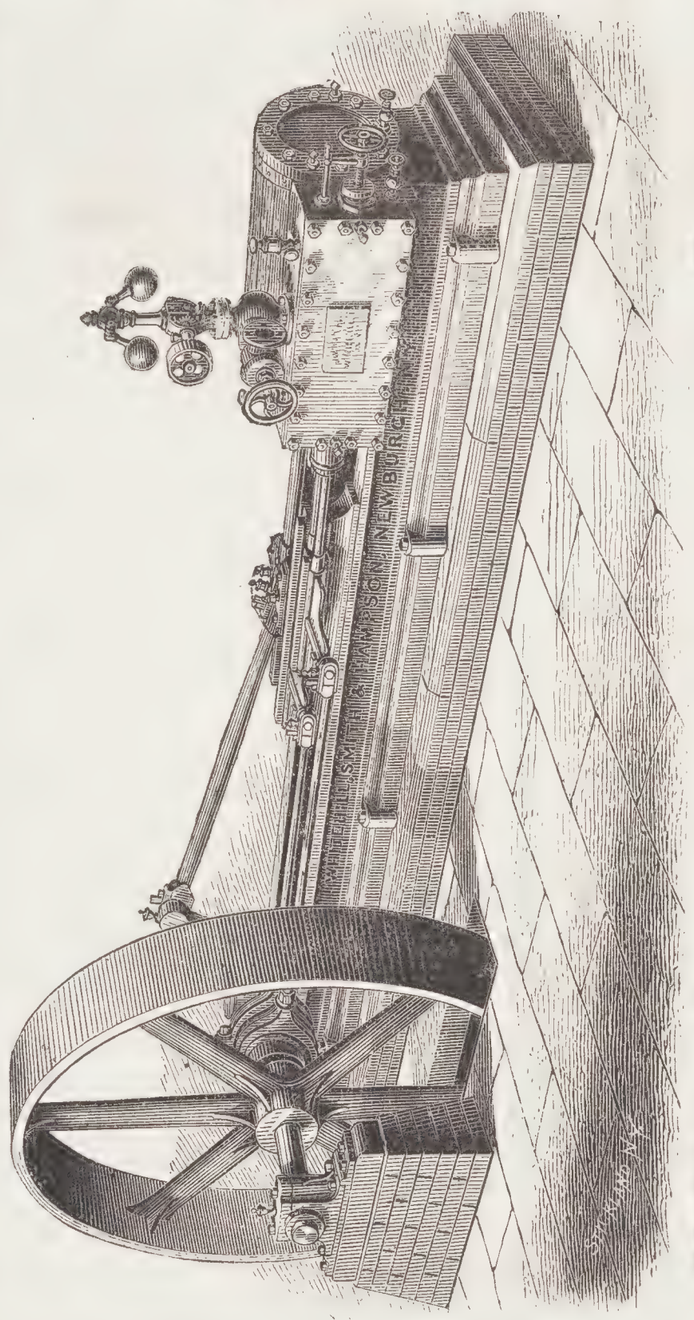

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THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

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The Seventh Annual Meeting of the Railway Master-Mechanics' Association.

THE annual convention of this Association was held in Kingsbury Hall, Chicago, commencing on Tuesday, May 12th. About seventy-five members answered to their names on the calling of the roll, which number was subsequently increased by additional arrivals.

THE PRESIDENT'S ADDRESS.

Mr. H. M. Britton, of Cincinnati, the President of the Association, delivered a lengthy opening address. Each successive year, he said, had added to its numbers and increased the vigor of its organization. The society had united what has become a profession. It had mingled the thoughts, the ideas, the experiments, and the ascertained results obtained by its members; sifted them, culled what was good, thrown away the chaff, collated the facts, and given the benefits as far as ascertained to the world. So much yet remains to be done that the society should boast of having accomplished very little.

Referring to the undue extension of railways, the existing financial embarrassments in which they were involved, the hostility of the farmers and the attempts to regulate railway traffic by legislation, he said it became the duty of the convention to ascertain the measure of its own responsibility and to assist as far as possible in applying a remedy. It was a strange truth connected with the railway business, that the practical man is rarely consulted as to how roads should be constructed or whether it will pay to operate them. "I am quite aware," said Mr. Britton, "that your responsibility only begins when the railway is finished and its rolling-stock is to be operated. You are skilled in the profession. All that you are, and all that you hope to become, depend upon the well-being and good management of railways now and their prosperity in the future. Every week, almost every day, some practical man is sought to operate a railway; this is an assurance that you are to have more to say in these matters in the future than you have had in the past, and it is therefore well that your attention should be called to them. It is well that you, who, as practical men, are to make the earnings of the railway, should know whether its debts represent its cost or double its cost. It is well that when you go on to a new road you should know whether it has to be rebuilt after a dishonest contractor. It is well, above all, when you are invited to a position on a new road, you should know whether it is a road which by the best management can be made to pay at all, or whether it has been projected by some interested person for his private profit in its construction, and can not be made to pay, and you are called to waste your energy and time in attempting an impossibility. The railway having been built and being in operation, is your particular department free from all blame for the disaster about us? The traveling public, like every other portion of the community, seek ease and luxury. These parents of effeminacy they pay for with more willingness than they do for their railroad fare They get a pass over a road if they can, and pay with pleasure for the luxurious sleepers or parlor-cars. The public demand for luxury has created a rolling-stock as great in weight as it is delightful in ease. You know the cost of operating such rolling-stock. You know the weight of the locomotive required to move it. You know the excellent condition of the track indispensable to operating it at a high rate of speed with safety. Have you studied carefully to know whether the road with which you are connected can afford to be operated with this luxury with this speed? Are not lighter engines and cars and a more moderate rate of speed essential to profit in operating many of our railways? You reply that all this luxury and this great speed is no fault of the mechanical department; that it exists in consequence of a public demand, and that the public alone are responsible. The public is like a spoiled child in the matter—it takes all the sweet it can get, and cries for more. This calls upon you to exercise all your firmness and all your wisdom to put an end to a losing business, which you know must end disastrously. Let me beg every one of you, then, to renew your assiduity in these matters, and to do all you can to cause heavy rolling-stock to be removed from the roads you serve, unless the traffic is so enormous and lucrative as to bear the expense it entails. Involved in this question of operating the rolling-stock, for which you are directly responsible, is the cost of moving large bulks great distances and selling them at a profit. I had the honor, very briefly, to call your attention to this point a year ago.

"All the injury to the railway interest of this country which a misconception of this great question could do has been worked within a year. It is hardly possible to overestimate that injury. It had its origin in something akin to fraud, perpetrated by those who projected and constructed railways on the people of neighborhoods through which they passed. To obtain from the farmer pecuniary aid in the way of donations by representing to him that his bulky freight, in the shape of farm products, would find a high market and at a low rate of freight was one of the unfailing financial resorts of the projectors of these unnecessary roads. It was the hope held to the view of the honest and unsuspecting husbandmen, built upon a foundation of misrepresentation and falsehood. It has borne the bitter fruit which might have been foreseen. The deceived farmer, finding the rate charged by the railway did not bring him the promised market for his products, became a granger. The granger became a legislator, and treated the railway interests of great States with arbitrary laws and enactments. To regulate trade, not by the laws of supply and demand, not by the cost of doing the business, but by legislative enactments; to say that a railway shall haul a ton of freight for half a cent per mile when the actual cost is a cent, is as if you should require the farmer to sell his corn at 25 cents a bushel, when he can realize 50 cents by feeding it to his hogs, or as if you should legislate him into a sale of his hogs at some particular place in the State at half their market value. This seems absurd enough. Nevertheless, the granger, deceived into donating his money to build the railway, legislates with the passion of resentment—not with the wisdom which follows calm reflection. In Wisconsin, the railways complain that this legislation amounts to a confiscation of the railway property. What doubt, what distrust, what absolute ruin overhangs a great commercial interest, thus threatened by hostile legislation! Again, gentlemen, I hear you ask me, Is this our work? Did we build these roads? Did we deceive the farmer? Did we touch his donated greenbacks? Not at all. But, gentlemen, you are the practical operators of the roads. The farmer does not seek a dry-goods clerk to till his fields or to gather his harvest. Every week, almost every day, we hear that practical railway mechanics are coming to the management of railways. You should know the cost of operating these roads, and you should know how to operate them at the least possible cost; and it is the duty of every one of you, as you would protect the great commerce with which you are identified, to educate both granger and legislator as to the cost of transportation, so that they shall not do a great wrong to your traffic any more than you would legislate them out of the true value of the products of their soil. The granger must be reminded that before the railway was constructed he had no market for his products beyond the distance they could be hauled in wagons and profitably sold; whereas he now has a much wider and better market, although not always the highest in the whole United States. He must be reminded that, so eager was he for the construction of a railway near his farm, he often solicited its building at a high cost rather than that it should not be built at all. Thus he became, in a great degree, responsible for its construction. He has no right now to shirk his share of the responsibility; least of all, has he a right to legislate adversely to the interest he did so much to create. His best course is to protect the railway to do all it can to make it earn a fair interest on its true cost; for the prosperous road will be a real benefit to his property, while a bankrupt road is a burden to him as well as to its owners.

"Gentlemen, I turn to other considerations which bear upon the present non-paying condition of railways. As practical men, most, if not all of you, competent to practically operate a railway, I ask you if it has been ascertained yet that a steel rail is a necessity. If a better iron rail were made, involving but slightly increased expense, would the steel rail be required? In this question is involved the cost of producing a first-class iron rail in this country. That is by no means as low as it should be. The coal and iron miners of this country, unfortunately for the

railways, attempt to enjoy an annual strike. They attempt this carnival with such regularity that they are obliged to earn in six months enough to sustain themselves and their families a year. They would make better citizens, form better communities, earn more money at a lower rate of wages, and produce double the quantity of iron of a better quality if they worked all the year round. And then, I ask you, would there be any need of steel rails? If there is no need of steel rails, the cost of a first class road would be materially decreased thereby, and a lower rate per passenger and per ton of freight would suffice to pay the interest on that cost. Gentlemen, while we call on the laborer in the mines to be sober, industrious, skillful, and continuous in work, we must not shirk from considering how far our own labor and the labor which we employ has been at a rate so high as to materially interfere with operating the railways of the country at a proper cost." A widespread extravagance of living has prevailed throughout the country since the war. If this is one of the causes of the high price of labor, and if through it disaster is to succeed disaster to the railways of the country, every hour that the day of reckoning is put off only makes that reckoning more certainly necessary, and that ruin more general. It is our duty, therefore, to look the question squarely in the face, and to take those steps which prudence and wisdom demand, that our part in meeting a question so delicate and so full of difficulty may at least be fully and fairly done."

SECRETARY'S REPORT.

The annual report of the Secretary was submitted, showing the receipts for the past year to be $2238.50, an increase of $171. Thirty-two new members had joined the association within the year, and eight had withdrawn from it. Of these latter, one resigns on account of his name being omitted from last year's report; one on account of not being able to pay his dues; three on account of leaving the business; one from not being able to attend annual meetings, and two have assigned no reason. Two deaths had occurred, J. B. Gayle and J. B. Pendleton, leaving the total membership 243, being an increase of 26 as compared with that of last year.

LOCOMOTIVE BOILERS.

Mr. H. A. Towne, from the committee on this subject, submitted a lengthy report, which was read and accepted. The committee reached the following conclusions:

"Your committee still believe that the only certain and reliable mode of overcoming this evil is to purify the water before its introduction into the boiler. From their investigations, viewing the case as it now stands, they are prepared to recommend the following general rules:

"1. The purest water should at all times be selected. That which contains the least impurities which form incrustations—rain and surface water—is especially recommended, wherever it can be gathered to advantage, and means provided for settling or filtering, so as to prevent the deposit of mud and other floating impurities in the boiler.

"2. Owing to the fact that no panacea can be found for all the incrustation diseases, it is evident that if it is to be cured by remedies at all, a diagnosis of each case must suggest the proper treatment.

"3. That each railway company interested should submit a specimen of the various kinds of water along its lines to an expert, who shall confine his examination to the deductions of the injurious substances, and not to the absolute purification of it beyond the necessity of the case in question. For some years the Pennsylvania Railway and also the Reading Railway have found it advantageous to submit the water to an expert who tests for certain things only, and frequently a well pronounced unsuited is abandoned, and one dug near by may prove better adapted to the purpose. Each case requiring a remedy must likewise bear its own testimony.

"4. That a committee of three, consisting of the present committee and a competent chemist, be appointed by this convention to confer with one or more railway companies with a view to a practical trial of both Dr. Rogers's and Dr. Clark's process of purifying water for locomotive use, the expense to be borne by the company receiving the benefit.

"5. That reliable boiler compounds may in bad cases of scaling be used to advantage, when the circumstances are such that the water can not be easily purified before entering the boiler. This treatment must be followed up with frequent and thorough washing, otherwise little benefit can be expected.

"6. We find that roads which realize the greatest trouble from incrustation and mud advise the use of the mud-drum. Mr. Peddle, of Terre Haute and Indianapolis Railway, thinks a hand-hole, which he has used for some time, is equally as good as a mud-drum, and much cheaper; but your committee are inclined to favor the cast-iron drum now in successful use on the H. and St. Jo. Railway, on account of the benefit derived from the use of the blow-off cock, besides affording a convenient access to the boilers while undergoing repairs.

"In order to keep the cylinder part of the boiler clean, the blow-off must be used daily; also, blow-outs in leg and other parts of the boiler should be kept in order and used often. Crown-bars should have at least one inch clearance above the sheet, and should be fastened without thimbles."

As supplementary to the report of the committee, a paper was submitted and read by Professor Rogers, in which he enumerated and explained the impurities found in various kinds of water, and their action on boilers, and performed several experiments to show what chemicals were necessary to remove the impurities, or prevent them from forming incrustations. The preparation, of which he was the inventor, and which he considered best adapted for the purpose, was tannate of soda, an agent which theoretically met every demand, and by an extensive trial in all kinds of waters had proved effective.

Mr. Towne, of the Northern Pacific, said that by the use of the compound suggested by Prof. Rogers a sediment would be formed which was fully as difficult to get rid of as the incrustations, in view of which he considered that compound as useless as many others which had been tried and found wanting. He had arrived at the conclusion that the best plan was to use rain-water, where procurable, in preference to well-water, as it contained a smaller proportion of mineral matter.

Mr. Jackman, of the Chicago and Alton, introduced Professor Sewell, who stated that he had heard of and examined theories enough to purify all the water that had visited the earth since the flood, but he had not yet found any theories satisfactory in practice. He had at least made up his mind that the only way to prevent boiler incrustations was to remove the impurities from the water before it entered the boiler.

Mr. Jackman said that for a year he had been trying two boiler compounds, which, if not the same as tannate of soda, produced the same results. Common lake water, after being used in a boiler for a little over a year, left a crust more than an inch thick on the crown-plate, making it utterly useless. It therefore had to be removed, and a new one substituted; and he then began to use the compounds, putting in seven or eight pounds at a time. This, aided by a simple mechanical contrivance, kept the crown-plate perfectly clear. He thought, however, that the use of these compounds in such large quantities was impracticable in a locomotive boiler, as the motion was apt to produce a foam which would retard the action of the steam on the engine. He could not deny that the compounds were of use, but it was a question whether their expense was not greater than the cost of periodically taking out and cleaning the tubes, and once in a while substituting a new fire-box.

Mr. Jeffrey, of the Illinois Central, said the use of a heater for precipitating the carbonates of lime and magnesia held in solution, and subsequent filtering of the water before passing into the boiler, would prevent the incrustation. He had tried it on a stationary boiler, and thought it could be applied to locomotives.

Mr. Towne said that with respect to compounds, he supposed every one knew that there were some that would dissolve any incrustation. The question is, does this remove the difficulty? He claimed it did not. He referred to a report of inspection by the Hartford Fire Insurance Company. Put your compound into your boilers and soften the scale, and what good does it do if not blown out? Do the engineers open the blow-cocks and blow out the boilers every day? He knew they did not. And why? Because the master-mechanics do not enforce the rules. He had within the last three months discharged men for failing to comply with that order. As for cleaning out the boiler, it can't be done without taking out the flues. There was not a road in the country that could spare their engines from the track for this purpose, except it might be the Northern Pacific, which had more than 40 engines lying idle.

MECHANICAL LABORATORY.

Mr. Robinson, of the Great Western Railway, made a report from the committee on this subject, suggesting that the apparatus for such a laboratory should consist of the following machines and instruments: 1. Adjustable model valve motion. 2. Machine to test tensile, torsional, and compressive strength of metals. 3. Machine to test friction of metal. 4. Machine to test lubricating value of oils. 5. Steam-indicators with full diagrams of apparatus. 6. Most approved speed or revolution counter. 7. Pirometer for testing high boiler temperature. 8. Thermometer with long range. 9. Vacuum-gauge for use in locomotive smoke-boxes. 10. Mercurial column for testing steam-gauges. 11. Registering dynamometer for obtaining train resistances. 12. Microscope for examination of metals. 13. Means of testing caloric value of different classes of coal, and principles of their most economic combustion. 14. Means of testing various qualities of water used. 15. Means of testing acids in tallow under high temperature. 16. Means of testing incrustation compounds and discovering their injurious ingredients. 17. Means of testing composition of specimens of boiler-scale, etc.

After considerable discussion, the subject was referred back to the committee.

SAFETY-VALVES.

The committee on this subject submitted a voluminous report, embracing the opinions and experience of a large number of the best master-mechanics in the country. A large portion of the report related to the Richardson valve.

Mr. Sellers described a covering for safety-valves, which he had seen in use, and which he strongly advocated.

Mr. Robinson said he was very glad that Mr. Sellers had brought up that question. The Richardson valve, as now used, was a disgrace to master-mechanics. In blowing off it was very apt to frighten horses and cause runaways, and was doubtless responsible for many deaths. It was the duty of master-mechanics to see to this matter.

Mr. Farris said he had been unable to get the Richardson valve to work as he wanted it to do, and after thinking the matter over, he had made a contrivance which he considered far superior to the valve in question. Besides working much more easily and satisfactorily, the noise made by escaping steam was rendered much less disagreeable.

FUEL FOR LOCOMOTIVES.

The committee on the subject reported that they had received so few answers to their circular of inquiry that they were unable to furnish any information which would be either valuable or interesting to the association. They therefore recommended that the investigation of the question be continued and divided into subjects for two committees.

The report was received and placed on file.

BOILER EXPLOSIONS.

The committee on the subject submitted a report of the experiments made last season by the United States government, full accounts of which appeared in the newspapers at the time. As further tests were to be made this season, the report was referred back to the committee.

VALVES AND VALVE-GEAR.

The committee submitted a long report, of which the following is a recapitulation :

Of the fourteen members answering to the circular, four report in favor of balanced valves and six against, while nearly all agree that there is a reduction in the wear of seats and gear, and increased ease in handling. The grounds of objection are liability to blowing and difficulty of keeping in repair. The mileage of the balanced valve, where comparisons have been instituted, is considerably in its favor as against the flat valve. Seven replies are in favor of decreasing the size of parts from their experience, and two offer simply an opinion against reduction. The practice with lap is somewhat varied. Outside, two use 1 inch, eight use $\frac{7}{8}$ inch, and four use $\frac{3}{4}$ inch, the longer lap being upon the quicker-moving engine. Inside, one gives $\frac{1}{8}$ inch, one gives $\frac{3}{32}$ inch, five give $\frac{1}{16}$ inch, and five cut the valve-line and line ; the general practice standing in favor of inside lap to cushion on the pistons of quick-moving passenger-engines.

Mr. Hudson, of the Rogers Locomotive Works, said the subject was of much importance. Experiments had been made by the United States government officials, showing that, while the parts might be diminished to half their size, the passages could not be reduced. He was not favorably impressed with balance valves.

Mr. Jackman, of the Chicago and Alton, believed that committees were appointed, and served to the best of their ability, and sometimes it had been said too much time had been spent in discussion. But what the association wanted to get at was actual experience with balance valves : First, with the Adams valve. It had been in use three years, with good results, and was not costly in wear. The men who handle those engines say that they handle easily. They have worked well. He had also tested Mr. Elliot's valve—had it on six engines. But he had not taken up one since they were put in, so he could not say much about them. But he had put one on an engine without telling the engineer, and he had not noticed any difference. He believed the induction part might be made smaller. He had also tried a valve gotten up by a man in California, which he described. This he had on ten engines, and although there is some trouble in adjusting, as a general thing it works well, allowing the engine to run with the reverse lever between two notches, and allowing the same to be moved while running, with one hand. The difficulty with this was in the moving of the cylinder. He did not want the convention to understand that this balance valve could be used without some cost in putting on and running. Yet he thought they were successful. The Adams, the Elliott, and the Collier valve, all have worked well on his road.

Mr. Hays, of the Illinois Central, asked the results in the consumption of fuel, from the use of balance as compared with the old valves.

Mr. Jackman had come to the conclusion that the advantage in fuel was not more than 3 per cent. The saving, if saving there is, is in the wearing of the valve-gear. He thought a good deal had been saved on valve seats.

Mr. White, of the Evansville and Crawfordsville, had more than twenty-five years ago got up a valve similar to one described by Mr. Jackman. He had then learned that a man in Massachusetts had a similar thing. He thought if it had been a good thing, and invented so long ago, it would have been in general use.

Mr. Jackman had run an engine on the Boston and Worcester road many years ago, and it was the very one which had the valve Mr. White spoke of. It was different from the one he mentioned in many respects, which he pointed out. It was used for some two years and taken off. That had simply one cylinder with a piston working in it. The one he now used had a cylinder in a cylinder, a piston in the inner one.

Mr. Hudson, apprehended, with regard to the lifting of the valve, that it would depend a good deal on whether the engine was reversed or not.

Mr. Chapman, of the Cleveland and Pittsburgh, had recently used the Cummings valve with good results.

Mr. Jackman explained his manner of testing valves, by placing them in engines and giving them to his best runners, without telling them of it. If they discovered any change, he took advantage of it.

Mr. Elliot, of the Ohio and Mississippi, was pleased to hear the statement with regard to the Cummings valve, as it was simply a modification of the valve he was using. It showed a contraction of the part could be made, and allow the engine to do just as good work.

Mr. Hudson, some time about 1851, was in charge of the motive power of the Buffalo and Rochester road. Then, they had a valve in use calculated to diminish the pressure and maintain the size of port. They did not work, and he put in a new valve, covering one half the size of the port. They worked well.

Mr. Jeffrey, of the Illinois Central, remembered experiments made twelve years ago, on the Central, showing that as the area of openings increased, the pressure on the blocks would increase. The general conclusion was, that the pressure on the valve depended more on the opening under the valve than on the valve itself. A square box-valve, without either top or bottom, coming within one sixteenth of the steam-chest cover, with a ring held up by spiral springs, was in use during 20 months, some seven years ago. It would allow the reverse lever to be placed anywhere. But most of the time there was a slight blow, and perhaps this accounted for the engines not showing any better mileage for the coal. After that, they took a Rogers valve, and put a plate on it. On the under side of the chest they placed a groove, putting a ring between that and the plate. This was not satisfactory. Then a valve was made almost the height of the steam-chest, the top of which and the underside of the steam-chest were planed off. In heavy pressure this worked well, but not in light. Lately, a pair of valves had been placed in use, similar to the ones described by Mr. Jackman. They were not satisfactory, and were taken off. They have also in use a pair of Mr. Elliot's valves, and the use so far is rather satisfactory. The seats wear slightly convex, but the valve has been cut off a little, which may obviate it.

Mr. Woodruff, of the Central of Iowa, thought an important point was the travel of the valve.

Mr. Hudson wished to correct the statement of Mr. Jeffrey. The valve he alluded to as the Rogers valve should be called the Hackworth valve.

Mr. Robinson thought this discussion showed amply the need of a mechanical laboratory, by which all these experiments could be made, and their expense saved to the different roads.

Mr. Hudson said that when we talk about outside and inside lap, we always ought to say how much travel the valve had. Different results were had by changing the travel.

Mr. Jackman had no engines with less than four and a half travel, built none with less than five, and the limit was five and a half. The larger portion was five and a quarter.

Mr. Chapman, as the time was limited, moved the discussion close, and the motion prevailed.

SUBJECTS FOR NEXT YEAR.

The committee appointed to prepare subjects for discussion at the next meeting, presented the following :

1. The best material, construction, operation, and management of locomotive boilers.

2. Purification of feed-water—what methods up to this time have been most approved for the improvement of feed-water by chemical and mechanical means, and for the prevention of incrustation.

3. Locomotive tests. This committee to request members to make experimental tests to show the performance of locomotives, and to report the results to this association.

4. Locomotive construction. This committee to report as far as possible all new methods of construction which have been adopted by members during the past and ensuing year.

5. The best system of signals for operating railroad-trains—to include train-head signals, train-tail and side signals, road or station switch-signals, and appliances for indicating the speed of trains.

6. Locomotive and tender wheels. This committee to report breakages of wheels and tires, removals of tires, and causes of breakage or removal, and to report on the different methods of construction and manufacturing of various kinds of engine and tender wheels.

7. Construction and improvement of continuous train brakes during the ensuing year, and their application to cars and locomotives.

8. Lubricants for locomotives.

9. Mechanical laboratory.

10. Finance.

11. Trustees of Boston fund.

12. Printing.

18. General supervisory.

THE FRENCH METRIC SYSTEM.

Mr. Coleman Sellers, of the Franklin Institute, Philadelphia, read an exceedingly interesting paper on this subject, in which he examined the cost of making a radical change in the standard of measurement at this time, when the use of machine tools, gauges, etc., is universal, estimated the cost of changing and renewing the stock of an establishment equipped for 250 machinists at not less than $27,000, without any change in drawings, and the complete change at not less than $150,000. Mr. Sellers concluded that the adoption of the metric standard in this country is now neither practicable nor desirable.

The paper was ordered to be embodied with the official report of the proceedings when printed, and a vote of thanks was extended to the author.

LOCOMOTIVE TIRES.

The committee made a report, which was accepted. The superiority of steel tires having been already demonstrated, it only remained to be determined which was the best tire, and how their steel could be worn with safety. As it will take some time for those now in use to wear out, this information could not be furnished at present. The whole number of sets which had been reported on was 359. With regard to setting and fastening steel tires, ten replied in favor of using shrinkage alone, two used shrinkage and set-screws, and three used set-screws alone. Those who had used chilled tire reported favorably as to its durability. As to steel driving-axles, some thought their superiority over iron justified the increased expense, others preferred hammered iron to steel. All spoke favorably of steel truck-wheels.

LOCOMOTIVE AND CAR-AXLES.

The committee on the form and dimensions of axles made a report recommending the following dimensions as a standard for the form and proportions for freight and passenger axles : Total length over all, 6 feet $11\frac{1}{4}$ inches ; journal, $3\frac{3}{4}$ inches in diameter by 7 inches long ; wheel-seat, $4\frac{7}{8}$ inches in diameter by 8 inches long ; diameter in centre, 4 inches ; collar, $4\frac{3}{4}$ inches in diameter by $\frac{5}{8}$ inches in thickness. The committee are of opinion that, owing to the great diversity in the construction of locomotive engines, no standard for the form and proportions could be adopted in the construc-

tion of the axles without first making important modifications in the design and dimensions of other parts of the locomotive. Such modifications the committee do not believe were intended in the subjects they were appointed to consider. The report was accepted.

Mr. Wells felt that the committee should have given some reason for making restrictions in the size of axles.

Mr. Forney, speaking for the committee, said that they had conferred with the master car-builders at their convention in Boston, and had accepted their conclusions.

Mr. Fellows said he had had some experience with the axle provided by the car-builders, and had found it to be much more favorable for general use than the small journals, which in use cause considerable friction, and consequently "hot" boxes.

Mr. Jackman spoke of the advantages to be derived from a uniform size of axles.

Mr. Forney further stated that he had heard the opinion of many prominent railroad men, who were uniformly in favor of the large journal.

Mr. Wells objected to the large axle only on account of its weight.

Mr. Eddy stated that the Boston and Albany road had put the large axles into general use, and have found that the cars run much easier than with the small ones. He wished the convention to look into the matter closely before taking action.

Mr. Lilly had found that there was a great deal less friction by the use of the large axle than by the small one, but it had caused a greater amount of deflection.

Mr. Peddle could not understand how less friction could ensue when the size of the axle was increased.

Mr. Coleman Sellers explained that with the innovation of the present size of large axles a less velocity was caused, and consequently less friction.

Mr. Fellows was at first loth to make use of the large axle, but his road finally put them into use, and the one fact in their favor was the smaller amount of oil used. His experience coincided with Mr. Sellers's.

Mr. Towne had put a large axle in an engine on his road five years since, and the result has been very satisfactory. He was decidedly in favor of them.

Mr. Jackman said there was one feature concerning the use of the large wheel and axle—there was occasioned a greater weight, and the wheel necessarily pounded the track in running over it. Still he was in favor of the large axle.

Mr. Hudson found that the subject of the proper proportion of the size of the journal with regard to the weight to be carried was the principal point to be considered.

Mr. Forney thought that the simple fact of the increase of the journal was an evil, but combined with a necessity for strength, it was a necessity which could not be overlooked.

Mr. Wells thought that the size prescribed by the master car-builders was larger than was actually needed.

Mr. Forney said that a small axle might cover the present necessity, but it would not insure safety. He thought some official action should be taken by the convention concerning the axles, as to whether they should adopt the large size of axle.

Mr. Jeffries felt that some statistics should be prepared, concerning the wear and cost which the increased size would cause, and thus definitely ascertain the proper journal pressure per square inch.

Mr. Coleman Sellars stated that scientific experts had estimated the pressure an axle would sustain per square inch, and any further insight would be unnecessary.

Mr. Towne stated that they had no evidence concerning the practicability of the large journal, and he was not in favor of recognizing it as the choice of the convention, as a body, until it had been properly experimented with.

Mr. Lilly thought the reason Mr. Peddle's journals did not heat the crank-pin was, that they were so firmly held. An excess of friction can be overcome by lubricants. He agreed with Mr. Towne, and thought a greatly increased journal was not needed.

Mr. Johann was not prepared to vote on a certain sized journal at this session. He had corresponded with railroad authorities to ascertain their opinion concerning a correct size of journal, and had found that they all differed upon the subject. He thought that the subject had received sufficient attention, and he accordingly moved that the discussion be brought to an immediate close.

The report was referred back to the committee.

LUBRICATING OILS.

The committee reported that in their opinion lard oil was best adapted for lubricating the cylinders of locomotives. No evidence had been given that hard water was injurious to the value of lard or tallow oil as a lubricant other than the fact that a greater quantity of oil was required. The best method of oiling valves was to have pipes running to the cab, and supplied with suitable cocks to blow through with steam. This plan would relieve the fireman from any danger in oiling, was reliable, and could be so arranged as to accurately measure the quantity of oil, and thus prevent waste. For journal-bearings the committee recommended pure Virginia oil, and for passenger service No. 2 lard oil, as giving the best results.

CONTINUOUS TRAIN-BRAKES.

Mr. Wells, chairman of the committee on continuous train-brakes, read a report of almost interminable length. Replies to their circular had been received from 20 roads. Of these 3 use only the hand-brake, 14 the Westinghouse air-brake. The theoretic requirements of a perfect continuous train-brake were declared to be as follows:

1. Certainty of instant application to all or as many of the wheels of the train as practicable.

2. The retarding power should be capable of being graduated at the will of the person applying it, under all ordinary circumstances.

3. When applied, from any cause, it should so remain until the train is brought to a stop, unless persons in charge of it desire otherwise, in which case it should be capable of instant partial or total release.

4. The brake power should be under the control of the engineer of the train; it should apply itself automatically in case of derailment of any part of the train, or in case the train should part accidentally, and should be capable of application from any car in the train, at the will of the persons thereon, when necessary.

The balance of the report partook largely of the nature of a detailed descriptive advertisement of the Westinghouse compressed air-brake, which was represented as being the only thing that would answer the requirements.

A driving-wheel brake was recommended.

The opinion was, that trains can not be safely run by the use of hand-brakes. Automatic brakes were not recommended.

Mr. Peddle did not desire to criticise the report of the committee, but it appeared that they had not criticised the Westinghouse brake in the least, but had placed all the odium upon the Smith brake. He thought the Westinghouse was open to criticism, as well as the others. The Westinghouse was expensive, which was certainly not the case with the Smith brake.

Mr. Eddy stated that on the Boston and Maine road, the above two brakes were tested, and in experimenting with them it was found that the Smith vacuum brake brought a train to a full stop, and with greater ease to the train, than the Westinghouse. On his own road, the Boston and Albany, they had used the Smith and Westinghouse, and without speaking derogatorily of the latter, it had not done as good service as the Smith, having failed in several instances, which had never occurred in the case of the Smith.

Mr. Robinson.—What occasioned the failure of the Westinghouse?

Mr. Eddy.—The pump failed.

Mr. Jackman had no confidence in any steam-brakes, but believed in the automatic. He also desired to know how much steam was consumed for each appliance of the Smith brake.

Mr. Hays had witnessed the appliance of the brake when experimented with in Boston, and knew that there was no perceptible loss of steam in applying it.

Mr. Hodgman stated that the Westinghouse had cost his road $15 a month for repairs, while the Smith vacuum-brake had incurred none. The Westinghouse also caused a continual loss of steam also; their engineers claimed that they could make a great deal better time with the vacuum than with the Westinghouse.

Mr. Eddy in reply to an inquiry stated that the Smith brake operated as well upon a large as a small train.

Mr. Lawder, one of the committee, had used both brakes, and was pleased with both.

Mr. Jeffries had found upon the Illinois Central road that the estimated expenses of repairing the Westinghouse brake on each engine ranged from $5 to $7 a month the year round.

SUNDRIES.

A resolution of thanks accompanied by a donation of $500 for past efficient services of the secretary, Mr. J. H. Setchel, was adopted.

Resolutions of condolence on the death of Mr. J. B. Gayle were adopted.

The committee on narrow and broad gauge rolling-stock presented a report. The facts in the report were in tabular form. Report accepted.

Mr. Hudson explained that the weight of cars was less on the narrow than on the standard gauge, but there were some exceptions. There was nothing to show in favor of the narrow gauge, but much against it. Committee continued.

The present officers of the association were continued another year, and the city of New-York selected as the next place of meeting.

The convention then adjourned.

Sanborn & Gates, Car Ventilation.

A TRIAL of this system of ventilating cars was recently made with an excursion train on the Boston and Albany Railroad. A number of prominent railroad officers were on board the train, and witnessed the experiments. The apparatus is designed—

"1. To secure the entrance into and exit from a car of a sufficient supply to keep the air pure and healthful at all times. 2. To keep the whole body of air in a car in constant motion, and the fresh supplies so distributed to every part and attempered, if need be, that cold draughts or sheets of air may be avoided. 3. To have all the air which is introduced into the car cleansed from its accustomed impurities of dust from the road-bed and cinders from the engine. 4. To reduce the mechanical appliances to so simple a form that, while they are competent for the effective control of the air, they shall be substantially automatic in their action and require the least amount of attention from the employees of the road."

The following description of the apparatus and its operation is also by the inventors:

"Upon the centre of the axle-tree of one of the trucks is securely fastened a driving-pulley 22½ inches in diameter. From the driving-pulley runs a small triangular belt 1½ inches wide over another pulley 4½ inches in diameter, attached to a fan made of galvanized sheet-iron upon a steel shaft. This constitutes the entire mechanical adjustment for putting in motion the required supply of air.

"Ordinary car-wheels are 33 inches in diameter or 8.64 feet in circumference; hence, in passing over a mile of track the wheels will make 611 revolutions, and the size of the pulleys being as 1 to 5, the fan will revolve 3055 times; that is, when the train moves at say, one third of a mile per minute, or 20 miles per

hour, the fan revolves at about 1000 per minute, or 1500 at 30 miles per hour.

"To conduct the air, which has been excited and put in motion by the centrifugal force of the fan, to the top of the car, and to distribute the same evenly, the fan is surrounded by an elongated sheathing of wood which may be seen under the car, and which is continued by a tin conducting-tube through the closet to the distributing-pipes, which in turn emit the air into the car.

"This sheathing being air-tight, the fan is, so to speak, hermetically sealed, and none of the outside air can get to it or feed it except that which passes through the air-chamber. Now, since all the air which finds its way into the air-chamber must pass through the fine screens, which are inserted in place of the window glass, the dust and cinders must be left outside the car.

"Therefore the action is as follows: when the car is in motion in either direction (it makes no difference), there is a constant taking of this strained or filtered air by the fan and driving it through the tubes on each side of the dome, where it is forced into the car at such intervals as to secure its complete distribution. The constantly augmented supply in the dome causes a downward flow within the car, which resists the tendency of the heated air to escape upward, and thus utilizes the heat instead of wasting it; equalizes the temperature over the car, and finally forces the air out through the registers along the aisle.

"Without a resort to this method of counteracting forces or tendencies, which is now for the first time fairly provided for in a railroad car, the practical difficulty of properly heating in winter the large amount of air required would be well-nigh insurmountable.

"As to the quantity of air driven into the car by this arrangement, it may be stated roughly that when the car moves at full speed the delivery each minute is equal to the cubical contents of the car exclusive of furniture. If less is needed, a single movement of the cut-off or damper in the air-chamber reduces the amount as required, or shuts it off altogether. The maximum quantity may also be indefinitely increased by augmenting the size or speed of the fan.

"As important incidents or adjuncts of this system, though not necessarily parts of it, should be mentioned the facilities for attempering the air either by heating or cooling, moistening or drying.

"Within the passage-way for the air leading to the fan may be placed a stove or a cooler, or an evaporator, according to circumstances, each very simple but quite effective for changing the condition of the air within the car, as may be seen."

The following results of experiments made during the trip were reported by the gentlemen who acted as a committee of observation:

"Cascarilla bark was burned in the air-chamber, and diffused instantly throughout the car.

"A small quantity of cologne was placed in the air-chamber, and the odor was immediately perceived in every part of the car.

"The same effect was made visible by smoke made in the air-chamber, which found its way at once to a uniform diffusion in the car. The air was then shut off, and the car was filled with a dense cloud of smoke. Upon turning on the air, the smoke was principally removed in three minutes, and in 6 minutes 30 seconds the car was completely cleared.

"Notwithstanding the large amount of air taken into the car, there was neither dust from the road-bed nor cinders from the engine.

"The readings of the hygrometer at different hours of the day were as follows, showing that the condition of the air at any time can be greatly modified and controlled by this system:

	Dry bulb.	Wet bulb.	Evaporating power.	Relative humidity.
At 11 o'clock A.M. showed..	75°	58°	17°	30 p. c.
At 12 m. showed....	69°	54°	15°	31 p. c.
At 12.22 P.M. showed.....	68°	54°	14°	34 p. c.
At 12.37 P.M. showed.....	68°	57°	11°	47 p. c.

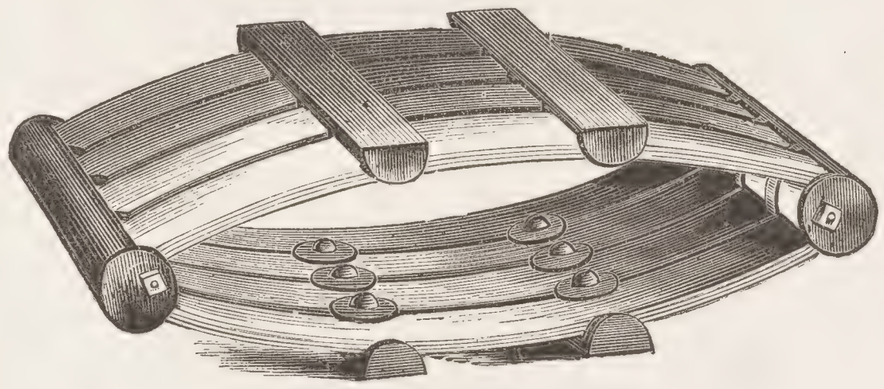
"The above changes were effected by means of a er and an evaporator within the air-chamber.

"Several of the party visited other cars in the train, and on returning remarked the perceptible difference in the purity of the atmosphere in favor of this car."

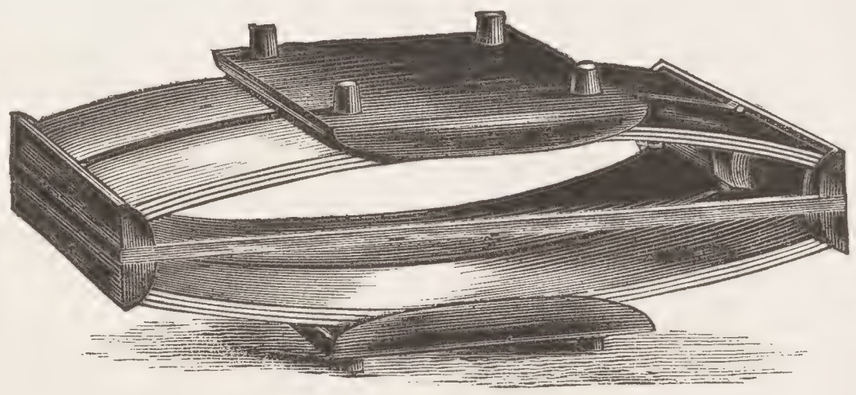
The Combination Elliptic Car-Spring.

In its general form, this spring resembles the ordinary elliptics, but differs from them in essential peculiarities of construction, as will be seen by a glance at the engravings. The ordinary elliptic, although a very popular spring and extensively used with all classes of rolling-stock, is nevertheless objectionable in some respects, and any improvement in construction by which its defects can be remedied is of course greatly to be desired. These defects are briefly as follows: The working strain is wholly borne by the long or inner leaves, the outside or shorter ones merely distributing the pressure a certain distance each side of the centre. In its action, metallic surfaces exclusively are brought in contact, unrelieved by the interposition of any material to soften or modify the effect of such contact. When the spring is in position, the bearings are confined to one central point, which does not at all times prevent the spring from sagging or getting out of line. It is also heavier than it should be, and more difficult to repair in case of breakage.

In the construction of the Combination Elliptic, these difficulties are to a very great extent overcome. As its name implies, it is a combination of different materials, and these are steel and rubber, the peculiar elastic properties of each being utilized in a way best adapted to this form of spring. The main design is to secure an easier and steadier action, and this is accomplished by using a less number of leaves and all of an equal length, so that each sustains its proper share of the pressure. They are also held securely in position by the double bearings in the centre, and wrought-iron clasps at the ends, and have a free sliding action their entire length. The ends of the upper and lower leaves take a full bearing upon rubber rollers, while a cushion of the same material is also placed between the leaves and the two central bearings, thus effectually breaking the continuity of metal between the journals and car-body. The double bearings are kept in position by lugs let into the swing-beam and spring-plank, and these, in connection with the clasps which hold the ends, keep the springs upright and in line. This method of construction has also other advantages, namely, less weight of metal is required, which of course correspondingly lessens the cost; repairs are more quickly and easily made, and the durability of the spring is fully equal to that of the ordinary elliptic.



Passenger-Car Spring.



Freight-Car Spring.

What we have said has reference more particularly to passenger-car springs. These can be used in couplets, triplets, or quadruples, and are also adapted to mail and baggage-cars and to four and six-wheeled trucks. The satisfactory working of the springs depends very much upon their proper adaptation to the weight of the car. This is a matter which requires special attention. The spring-hangers should be of such length as not to compress the springs below the point to which the weight of the car, without passengers, will carry them. If the springs are found to be too rigid, the bearings may be moved a little toward the centre, but in no case should they be placed close together. If by moving them one inch nearer together, the desired motion is not obtained, the springs are too strong for the load and should be replaced by lighter ones. On the contrary, if they are found to be too weak, the bearings may be moved an inch farther apart; but if this does not give the desired rigidity, they are too weak for the load. When properly put on and accurately adjusted to the weight and capacity of the car, they have an ease of motion that is not equaled by any other spring, the action of the several plates being uniform, and the rubber cushions preventing any disagreeable jarring and pounding caused by contact of metal.

The springs designed for freight service, as will be seen by the cut, are somewhat different in their construction. Their length ranges from 13 to 20 inches, with a capacity for carrying from 12 to 22 tons, including car and load. The ends of the leaves rest upon a shoulder of the end-clamps, and have sufficient play to permit them to straighten under extreme pressure. The clamps are held by a wrought-iron band, as shown, and the central bearing-plates rest upon a layer of rubber, the whole forming a simple, cheap, and durable spring. Both freight and passenger springs are now in use on a number of leading lines of road, and if there are any instances where they have not given satisfaction, it has been altogether owing to the fact that the springs were not adapted to the car, or were not adjusted according to directions.

Any farther information in regard to them may be obtained by applying to Vose, Dinsmore & Co., who are the manufacturers.

Deposits in Boiler Flues.

Prof. Hayes gives, in the *American Chemist*, the following opinion regarding the formation of deposits in boiler flues:

They are of two kinds, both of which are capable of corroding the iron rapidly, especially when the boilers are heated and in operation. The most common one consists of soot (nearly pure carbon) saturated with pyroligneous acid, and containing a large proportion of iron, if the deposit is an old one, or very little iron if it has been recently formed. The other has a basis of soot and fine coal ashes (silicate of alumina), filled with sulphur acids, and containing more or less iron, the quality depending on the age of the deposit. The pyroligneous deposits are always occasioned by want of judgment in kindling and managing the fires. The boilers being cold, the fires are generally started with wood, pyroligneous acid then distils over into the tubes, and, collecting with the soot, already there from the first kindling fires, forms the nucleus for the deposits, which soon become permanent and more dangerous every time wood is used in the fireplace afterward. The sulphur-acid deposits derive their acids from the coals used, but the basis material, holding these acids, is at first occasioned by cleaning or shaking the grates, soon after adding fresh charges of coal. Fine ashes are thus driven into the flues at the opportune moment for them to become absorbents for the sulphur compounds distilling from the coals, and the corrosion of the iron follows rapidly after the formation of these deposits.

You can't eat enough in one week to last you a whole year, and you can't advertise on that plan either.

Improved Terminal Facilities in Jersey City.

THE inadequate terminal facilities of New-York City have at length become a matter of serious attention. Improvements are being projected in all directions, both within the limits of the island and on the opposite shore of the Hudson. The two trunk lines of railroad terminating in Jersey City have for some time past been steadily at work perfecting improvements of a permanent character for the accommodation of their freight and passenger traffic.

Since the destruction last season by fire of the ferry-house and passenger-station of the Erie Railway, vast changes have been made in the appearance and condition of that terminus. The old ferry-house, which was a dilapidated structure, has been replaced by a lofty and substantially-built edifice of two stories, with a tower and other ornamentation, giving it an elegant appearance. The building is about 400 feet long, and contains a large and admirably ventilated waiting-room for the accommodation of passengers, finished in oak and black-walnut. The second story contains rooms for the officers of the ferries, railroad engineers, conductors, and other officials. It is conceded to be one of the best-planned ferry-houses in this country. The tower was built with a view to the introduction of the electric light, for use in thick weather. This light, it is said, can be seen through the densest fogs.

Connected with this ferry-house there are now three slips, so that in case the travel warrants it, ten-minute boats can be run during the present season. As the piers and slips were all greatly damaged by the fire, they have been reconstructed in the most thorough manner. To connect with the new ferry-house, plans for a passenger-station have been prepared, and the work of building will soon be commenced. The new station is to be about 700 feet long, and will contain ample room for the accommodation of passengers and incoming and outgoing trains.

Two new freight-houses, 761 feet in length, have been built on piers north of the ferry-houses, and by means of them freight can be transferred from the cars to barges at one handling, or from barges to cars, as the case may be. These freight-houses are substantially built of wood, but have iron roofs. Wood is used instead of iron in the construction of these buildings, because experience has proved that, while iron houses may be durable, yet when erected on piers they are liable to get out of shape by the settling of piles, and when once askew it is found impossible to right them. Wooden structures can be easily repaired and raised when settled, and iron roofs protect them from the fiery cinders of passing steamers.

The Pennsylvania Railroad Company has already commenced using a part of its new depot at Jersey City for the accommodation of passenger-trains. The passenger depot, when finished, will inclose a space of 228 by 620 feet, and have twelve tracks. The side-walls are of brick, and rest on a foundation of piling. The roof is supported on oak posts, and these rest upon iron columns, which, in turn, have wooden piles for their foundation. There are five spans in the roof—namely, four of 36 feet each, and one of 84 feet. The entire roof is to be covered with tin. Four tracks, which will occupy a place under two of the smaller spans of the roof, will be used solely for the washing and general cleaning up of cars. The other eight tracks are intended for passenger traffic. The floor between the several tracks is to be paved with Belgian blocks; and the platforms, which are to be fourteen feet in width, are to be made of artificial stone. At the river end of the depot there is to be a passage-way forty feet wide, running the whole width of the house, from which access will be had into the general waiting-room. This apartment is planned to be eighty by eighty-four feet, and has private rooms for ladies and gentlemen, ticket-rooms, offices, and restaurants adjoining. From these waiting-rooms, access is had to a covered way or street, sixty feet wide, which runs the entire length of the river front, and on this avenue all of the ferry-slips open. These waiting-rooms will be neatly finished. The old ferry-house will be replaced by a new one, 47 by 120 feet, during the present summer.

It is the intention of the company to separate its freight and passenger traffic entirely between Newark and Jersey City, and with that view it has erected the numerous new buildings and trestle-works on the Hackensack meadows. With its immense freight rolling-stock out of the way, and with the Bergen cut widened, as it soon will be, so as to admit of additional tracks, quick transit for passenger trains will be greatly facilitated on this division of the road.

The new buildings for the repair-shops and freight department on the Hackensack meadows cover fourteen acres of ground. The foundations rest on piles, which were driven down fifteen feet, when a stratum or crust of coarse gravel was found, and this is considered ample to support almost any weight that may be put upon it. The wooden piles were cut off below low-water mark, which renders them indestructible, and on this foundation the superstructure rests. The buildings are of brick with iron cornices and slate and tin roofs.

There is standing-room on the multitude of tracks here for more than three thousand cars, and they are so arranged that freight is sent into New-York in the order of its arrival. Ordinarily, as railroad men know, freight which arrives first during a busy season is the last delivered; but under the new order of things, this difficulty is avoided.

One of the most remarkable improvements on the Hackensack meadows is the immense trestle-work for coaling trains. This timber-work is 200 by 400 feet, and is reached by an inclined plane 1000 feet long. There is a capacity here for the storage of 8000 tons of coal, and engines of passenger or freight trains can be coaled in from one half to one minute. Already about one million and a half dollars have been spent in the improvements on these meadows, and the estimates for the present season's expenditures are $450,000. The entire cost of the work when finished is estimated at about $3,000,000.

The Operation of Brakes.

WE make the following extracts from a pamphlet recently issued by Mr. William Loughridge, of Baltimore, in reply to circulars issued by the committees of the Master-Mechanics' and Master Car-Builders' Associations on the subject of train-brakes. Mr. Loughridge has for many years given his attention to the construction of brakes, and is now applying one of his own design to the rolling-stock of the Baltimore and Ohio Railroad. The power used is compressed air, and for the past two years the brake has proved highly satisfactory to the officers of the road. In regard to some of the general principles to be observed in the construction and application of continuous train-brakes, he says that locomotives and brakes are a mechanical means for utilizing the adhesion of the wheels to the rails as a force to move and stop trains, the tractive force being governed by the weight on the driving-wheels of the former, and the retarding force by the pressure of the brake-shoes on the wheels of the train, the sum of these two forces varying in pounds from one fifth to one twelfth of the weight of the wheels on the rails. Hence, knowing the sum of the actuating force, there is always reliable data for determining the distance and time required to impel a train from one point to another, or to stop it at any given distance or time.

"When the coefficient of friction or adhesion of the wheel and rail diminishes from the (maximum) dry, clean rail surface to the (minimum) misty, wet, greasy surface, the force or pressure of the brake-shoe on the wheel must be *graduated*, in proportion to the several unguent coefficients of friction, so as to induce at all times between the brake-shoe and the wheel a compensating force or friction, that will, with the other forces or frictions of the journals, equal the adhesion of the wheels to the rail. When these forces are equal at the two equal distances of the (lever) wheel from the axis of motion or axle, the wheel will cease to roll, and become a sled sliding on the rail. This evil of sliding wheels on the rails must never occur in a perfect brake on any condition of rail surface; for it is not only objectionable on account of the expense and evil of flat wheels, but the retarding force is lessened materially, for the reason that the slipping wheel scrapes up the grease and distributes it along the rail, lubricating the entire surface, thus lessening the adhesion or retarding force.

"The indispensable element in operating car-brakes is in the application of a maximum force so as to utilize all the adhesion of the rail, at all times and under all conditions of surface, without sliding the wheels, and whether the track is dry or otherwise; and to deliver on each wheel a force, by the contact of the shoes with the wheels, proportionate to their weight on the rails, or the variable coefficient of friction. Then we have employed all the force or means possible to stop the train in the shortest distance, and here we must rest satisfied until some new discovery improves it. The mechanical means to accomplish this end must be automatic, for it can not possibly be accomplished by man's judgment or expertness.

"A fixed force, as the action of the atmosphere on a vacuum, or gravity on matter, will not accomplish the end perfectly for they are an even force, and in the application of car-brakes, uneven forces, varying one hundred per cent, are required. Compressed air or a vacuum throughout the main pipe or conduit of an air-brake mechanism, is an even force from the engine to the rear car. Hence, unless the area of cylinder or disparity of lever power is adjusted proportionately to the weight of the train, the full retarding power can not be utilized; or if the area of cylinder or leverage in each car were adjusted proportionately, still it would not accomplish the end perfectly, for the reason that the load in the car often changes one hundred per cent, as in the case of Adams's Express, and other cars being loaded in one direction, and return empty. Now, if a train is equipped perfectly, so as to deliver to each wheel in the train its due proportion of force, and one of the cars has its weight reduced one hundred per cent, then the effective retarding force on the majority is lost, or the wheels in the lighter cars will slide."

In regard to the hanging of brakes, Mr. L. says, "That the proper place is outside of the wheels or truck, where they can be easily repaired or inspected. When placed between the wheels, they are very difficult to put up and take down, and the power applied to the brakes always tends to spread the wheels, which, with the weight of the car-body, tends to weaken the truck, especially when the cord or straps of iron that hold the pedestals together break. Brakes applied to one side of the truck, and to only one pair of wheels, create a tortional strain on the axle equal to one fourth the weight of the car, or the resistance of the friction, and tend to loosen the wheels on the axle with the same strain. Some have recommended placing independent wheels on the axle, inside of the car-wheel, so as to obviate the wear of the latter. This would be impracticable and useless, as the rubbing of the shoes on the wheels is a decided advantage, for it tends to keep the surface even, as the weak or flat places on the wheel are never touched by the brake-shoe as it passes over them, the abrasion being only on the higher part of the shell or chill. The best point that I have discovered for hanging the brake-beams is to have the centre of the beam four inches below the centre of the car-axle. When the beam is hung level with the axle, the pressure tends to "rock" over the brasses and close the wheels together, which increases the distance that the brakesman must wind up his chain. Hanging brakes to the bodies of cars is objectionable, as when the car turns on heavy curves, it presses the shoes laterally against the flanges of the wheels, costing considerable power. Care should also be observed when hanging the brake-beam to the truck, so as to prevent

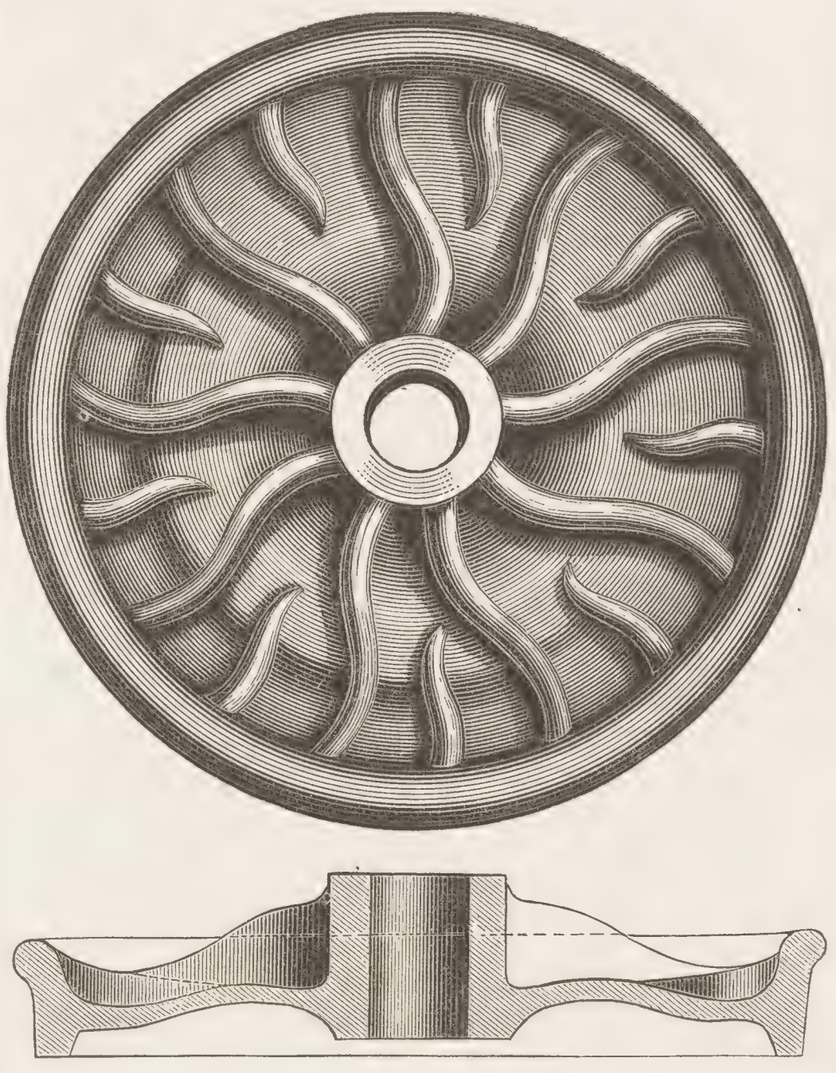
the shoes rubbing the flanges when too much lateral play takes place on the journals.

"When the brake-beams are hung to the trucks, they should be fastened so that the shoe when new barely touches the face of the wheel. They are frequently hung away from the wheel as much as two inches, so that gravity shall assist the springs in keeping them away. In many cases springs are dispensed with and gravity alone depended upon to keep the shoes from slamming against the wheels. If the beams are allowed to swing back and forth without any interruption from springs, the wear on the shoes and retarding effect on the car are equal to having them hung close to the wheels. It is poor economy to dispense with springs or to depend upon gravity to keep brake-shoes away from the wheels. Brake-shoes should always be hung parallel with the face of the wheel. This is one of the most difficult problems relating to the whole subject, from the fact that when the springs bearing the truck yield or give way, it lowers the brake-shoe from its original relation to the circumference of the wheel, but if the springs under the truck maintain their original set, there is no difficulty in keeping the concave shoe parallel with the convex face of the wheel, provided proper means are used to hang the brakes. The heavy levers and connecting rods that fulcrate in the levers tend to throw the shoe inwardly at the top, and cause the shoes to wear or rub the wheels, costing in the aggregate a serious loss of power.

"The brake-beams should, when hung to the truck frame, balance perfectly, and the fulcrum on which the beam pivots should be at the top of the shoe, or its equivalent, to prevent the beam from turning or rolling; but when the lever sets some six inches inside the beam, this is nearly impossible when running on undulating tracks."

Practical and Theoretical Knowledge.

PERHAPS no class of men overestimate the value of their own knowledge and underestimate that of others so much as the students and graduates of technical schools and colleges. Many of them seem to think that all the problems of life are soluble by what practical men call the $x + y$ process, and it is only by the hard knocks of practical experience that these learn how much and how little value mathematics and pure science have in conducting the affairs of life. On the other hand, practical men are very apt to disregard, or rather not apprehend, the fact that other men have been and are still engaged in the same occupations that they are, and are gaining experience and knowledge which is quite as valuable as theirs. There is a certain kind of dense obtuseness to which practical men are prone, which, if not counteracted by reading or some other method of gaining knowledge, becomes one of the most hopeless of mental conditions. The authority intrusted to most railroad officers insures a certain amount of deference to them, and makes them objects of flattery and exposes them to all the arts which skillful salesmen know so well how to use to secure orders and the good-will of those with whom they do business; until finally, inclosed within their own narrow sphere, if they do not go beyond it, either by reading or by meeting people who are wiser than they, it is very apt to lead to an inflated condition of hopeless vanity and conceit. One of the greatest preventives of this state of mind, and the one that is within the reach of all, is the companionship of books. On the other hand, books alone breed a disease almost as bad as that we have described. The young student, with his honors fresh upon him, is apt to think that all knowledge is to be found in the books, and that the man who can calculate the theoretical strains on a bridge is a competent bridge engineer. Alas! how such fond dreams and airy bridges are sometimes crushed! Most of us who have studied in the practical school of a machine-shop know what objects of ridicule and subjects of practical jokes the nice young men are who come there to exercise their science and learn their ignorance, which latter they are quite sure to do if they stay long enough; and it is generally the most valuable acquisition which such persons can gain. If we regard the deficiencies of both classes, it will, or should be, great cause of regret that the two kinds of knowledge can not be more assimilated—that is, that one class, who know books, do not get the practical knowledge, and that those who have the latter do not add to it the information to be found in books, and, what is perhaps more important, the mental discipline which study gives.—*Railroad Gazette.*



Elmslie's Improved Car-Wheel.

THE leading feature of this improvement consists in the fact that about 50 pounds of metal are saved in each wheel without impairing either its strength or durability. The wheel has but a single plate, the pattern of which is shown in the engraving, and is similar to the front plate of the Washburn wheel. The back is strengthened by nine long curved webs deepening toward the hub, also by a short web like those in the ordinary wheel. Aside from the saving in weight, which is getting to be a very important consideration in whatever pertains to railway rolling-stock, the loss usually resulting from defects in the ring-core is much less with this pattern. It has already been extensively introduced on the Canada roads, and has thus far received the approval of experienced railway mechanics. The following is the scale of weights:

33-inch	car-wheel	460	pounds.
30 "	truck and tender	400	"
30 "	car-wheel	385	"
28 "	truck "	325	"
26 "	" "	275	"
24 "	" "	250	"

For further information, apply to the patentee, George Elmslie, Toronto Car-Wheel Co., Toronto, Ont.

Queen Victoria's Palace-Car.

THIS vehicle is forty-three feet long, nine feet wide, and its height from the rails is thirteen feet two inches. The body rests upon a frame of Tabasco mahogany, decorated at the four corners with carved lions' heads. The panels of the exterior are painted in brown and white, relieved with gold mouldings; the handles of the doors being of a tasteful pattern.

The central compartment, that which will be used by the queen, is elaborately yet chastely decorated. Its length is fifteen feet seven inches, its height seven feet nine inches, and its width eight feet one inch. The panels lining the interior are of sycamore and satin-wood, the wood-work of the lounges and chairs being also of the last-named material, while the coverings are of dove-colored silk terry, trimmed with rose, thistle, and shamrock pattern braiding. A splendid Axminster carpet of white and green ground, decorated in the centre with the royal arms, covers the floor, while the ceiling is white, relieved by gold mouldings and green and gold scroll-work. The curtain-poles are silver-plated, with a crown at each end; the curtains, which hang by ivory rings, being of green silk. Four gilt figures of Atlas support the curtain-poles with excellent effect. The saloon is lighted by a large duplex lamp, with five inches of flame, and has a solid silver sectional reflector. There are also four reading-lamps with opal glass shades. Venetian mirrors are fixed in the doors.

Small handles are fixed on each side of the saloon, and provide electrical communication by which Her Majesty can call her attendants from the minor compartments of the carriage, of which there are four, two being for the personal servants. In all the details, the greatest attention has been paid to any thing which might conduce to the comfort of the queen.—*American Artisan.*

Babbitt-Metal.

MELT separately 4 lbs. of copper, 12 lbs. best quality Banca tin, 8 lbs. regulus of antimony, and 12 lbs. more of tin while the composition is in a melted state. Pour the antimony into the tin, then mix with the copper away from the fire in a separate pot.

In melting the composition, it is better to keep a small quantity of powdered charcoal on the surface of the metal. The above composition is called "hardening." For lining the boxes, take 1 lb. of hardening, and melt it with 2 lbs. of Banca tin, which produces the lining metal for use. Thus the proportions for lining metal are, 4 lbs. of copper, 8 lbs. of regulus of antimony, and 96 lbs. of Banca tin.

The article to be lined, having been cast with a recess for the lining, is to be nicely fitted to a former, which is made of the same shape as the bearing. Drill a hole in the article for the reception of the metal, say a half or three quarters of an inch, according to the size of it. Coat over the part not to be tinned with a clay wash, wet the part to be tinned with alcohol, and sprinkle on it powdered sal-ammoniac; heat it till a fume arises from sal-ammoniac, and then immerse in melted Banca tin, taking care not to heat it so that it will oxidize. After the article is tinned, should it have a dark color, sprinkle a little sal-ammoniac on it, which will make it a bright silver color. Cool it gradually in water, then take the former, to which the article has been fitted, and coat it over with a thin clay wash, and warm it so that it will be perfectly dry; heat the article until the tin begins to melt, lay it on the former and pour in the metal, which should not be so hot as to oxidize, through the drilled hole, giving it a head, so that as it shrinks it will fill up. After it has sufficiently cooled, remove the former.

A shorter method may be adopted when the work is light enough to handle quickly—namely, when the article is prepared for tinning, it may be immersed in the lining metal instead of the tin, brushed lightly in order to remove the sal-ammoniac from the surface, placed immediately on the former, and lined at the same heating.—*Cabinet-Maker.*

THE Mutual Relief Association of the employees of the Boston and Albany Railroad Company consists of 841 active members. The fourth annual report, made March 25th, shows the relief fund at that time to be $841, and the guarantee fund $787.19. Since May 12th, 1873, the association has paid to the families of deceased and disabled members the sum of $9285.

THE office of the Lock-Nut and Bolt Company of New-York has been removed from 61 Broadway to 17 Dey street.

The National Car-Builder,
PUBLISHED MONTHLY,
BY
VOSE, DINSMORE & CO.,
32 Warren Street, New-York; 52 Fifth Avenue, Chicago; 720 North Second Street, St. Louis.

JAMES GILLET, EDITOR.

Terms, One Dollar per Annum.

JUNE, 1874.

Editorial Announcements.

Correspondence.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

Advertising Rates.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. Dinsmore, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Engravings and Illustrations.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in The National Car-Builder *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Iron Railroad-Cars.

There are many practical mechanics who believe that iron may be advantageously used as a substitute for wood in the construction of railway car-bodies, and numerous attempts have been made to establish by actual test its superiority for this purpose. Although these experiments have not thus far been so entirely successful as to settle the problem in favor of iron, they have not at the same time been such conspicuous failures as to discourage further attempts in the same direction. When we consider the innumerable uses to which this metal is applied in the various branches of mechanical construction, and the extent to which it is taking the place of wood in our street architecture and in the building of ships and bridges, it is not surprising that inventors should endeavor to utilize it still further by its employment in the construction of cars. As to its superior adaptation to many uses for which wood has hitherto been relied upon, there can be no question, but it does not necessarily follow that it is equally well suited for all structures that have heretofore been built of wood. Railway-cars, as compared with stationary structures, are subject to certain peculiar conditions inseparable from the uses they perform. These are rapid locomotion, a minimum of weight, constant liability to violent concussion, and a necessity of being easily repaired. Whatever material enters into their construction must be subject to these conditions. They are the vital elements of the problem, and must not for a moment be lost sight of. As between iron and wood, the latter would seem to be by far the most suitable on account of its lightness, compressibility, the capacity of longitudinal timbers to resist the shocks of end collisions, and the comparative ease with which ordinary breakages may be repaired. It is maintained, however, in behalf of iron, that a car made of it need not necessarily weigh more than a wooden one; that, if rightly constructed, it will resist without material damage shocks that would ruin a wooden car, and that, however much it might be bent or broken, it would neither splinter nor burn; and furthermore, that its great durability and the value of the material after the car is worn out, will more than compensate for any special advantages inherent in wood.

So long as timber is as plentiful and cheap as it is now, there will be a prejudice against metallic cars which will prevent their adoption to any very great extent, even for freight service, no matter what may be their intrinsic merits. The supply of timber, however, is limited, and the cost of the most desirable kinds increases year by year. The iron supply, on the other hand, is inexhaustible, and with increased means of production, it is likely to become cheaper instead of dearer, even in the face of increased consumption. That it will at no very remote period be recognized as the most economical material for freight-cars, is not improbable. Its advantages, however, will have to be clearly demonstrated. The model iron car has most likely yet to be built, or if it is already in existence, it is a trifle in advance of its time and can hardly expect to meet a ready appreciation. The most successful experiments thus far appear to have been made in Europe; but the differences between European and American railway practice and construction are so great that each constitutes almost an art by itself. Coal-cars, with their main frames of iron, and with a capacity of ten tons, have been in use on the roads of France and Switzerland for fifteen years, and more recently in the latter country, cattle, baggage, and passenger-cars of the same material have been adopted. They are represented as running on four and six-wheel trucks, and standing breaks and collisions better than wooden cars, the bolts and rivets only giving way, which can be easily replaced. These were not merely experimental tests, but constituted the regular equipment of roads. We have no information as to the size and construction of the passenger-cars, except that they were made of iron, and the inside work, such as seats, sashes, etc., of other material. We have somewhere seen an account of a passenger-car built in Glasgow, of wrought-iron, and of a tubular form, the plates being riveted together without any frame-work, so that every part had the strength of an arch. The interior, excepting the floor, was cushioned with a non-conducting and incombustible material, and fitted up in commodious and elegant style. It was claimed to be as light as wooden coaches of the same length and capacity, and to have a much greater power of resistance. Many experiments have been made in this country. Iron freight-cars were tried about two years ago, if we mistake not, on the Baltimore and Ohio road, and were found to be an improvement upon wooden ones, with the exception that moisture or sweat gathered in the inside and injured certain kinds of freight. We may also refer in this connection to the steel freight-car of Dr. B. J. Lamothe, constructed of steel rods and iron pipes fastened together by malleable attachments. Whoever has carefully examined this car can hardly deny that it possesses substantial merits, but it is too great an innovation apparently upon established usage to be at once adopted. It must bide its time.

In view of the fact, patent to all, that a more intelligent and rigid economy must be practiced in the future management of railroads in this country, every plan or device which promises to diminish the cost or increase the efficiency of rolling-stock should be made the subject of careful investigation. And as this matter of iron cars comes within the special province of the Master Car-Builders' Association, and is bound to attract more attention in future than it has in the past, would it not be well to gather and place upon record at each annual meeting, such information bearing upon the subject as may be obtained from road-managers at home or abroad who have made or are making a trial of such cars?

The Master-Mechanics' Convention.

We copy from the Chicago papers, as full an account of the doings of the recent convention as our space will permit. The attendance was fully equal to that of last year. A large proportion of Western members were present, and a number of new ones were admitted. While no very decided or final action was taken upon any subject, the papers and reports submitted were voluminous and interesting, and show that during the past year the members have not all been idle. Some of the questions demanding solution are, from their nature, exceedingly perplexing and difficult. The causes and conditions which combine to produce boiler-explosions, and the pressing need of some method to prevent incrustation, are of this class. They are standard topics which come up every year, and, after more or less discussion and conflict of opinion, are laid aside until another meeting. There are other subjects, such as the consumption of fuel for locomotives, which can not be thoroughly elucidated without better and more systematic methods of obtaining statistical information than we now have. Indeed, there is scarcely any prominent feature of railway mechanism, whether pertaining to locomotives or cars, about which there is not more or less difference of opinion among practical mechanics; and one advantage of these annual gatherings is to develop these differences, keep them sharply defined so long as they exist, and finally harmonize them by the process of attrition, leaving such appliances to survive as are intrinsically the most valuable.

The discussions as reported for the Chicago papers are, of course, a mere summary of what was actually said. We give such portions as seem to be of special importance. There was a good deal said about the establishment of a mechanical laboratory, under the auspices of the association. The views of members in regard to the project were conflicting and unsettled, and the subject was deferred until next year. The purification of water, boiler incrustation, safety-valves, locomotive-tires, valves and valve-gearing, standard axles, and train-brakes, were also discussed. The two last-named subjects appeared to excite considerable interest. The committee on axles made a brief report, recommending for freight and passenger car and tender axles the same dimensions as those adopted by the master car-builders last year. The report was referred back to the committee. The committee on brakes made an elaborate report, embodying a detailed description of the Westinghouse air-brake, and recommending it as the best apparatus for meeting all requirements. A warm debate ensued, and judging from the brief report of what was said, the conclusions of the committee were rather fiercely assailed by several members. In the present state of the brake question, and in view of the rival influences and preferences which exist in regard to it, we think it would be about as easy to harmonize the warring extremes of doctrinal theology as to unite an association of railway mechanics in favor of any particular device. The discussion was closed without any definite action. Among the papers read, was one by Prof. Rogers on boiler incrustation, and another by Mr. Coleman Sellers on the French Metric System.

The intervening time between the sessions of the convention was improved by accepting the proffered hospitality of a large number of the principal business firms of Chicago engaged in the manufacture of railroad supplies. Excursions were made by land and water, and musical and theatrical entertainments provided under the direction of an executive committee, consisting of R. T. Crane, of Crane Brothers Manufacturing Company; A. L. Butler, of Vose, Dinsmore & Co.; E. S. Shepherd, of Crerar, Adams & Co.; Charles L. Rice, of C. L. Rice & Co., and J. S. Brewer, of the Union Car Spring Company. The Convention was in all respects a decided success, which argues well for the future growth and prosperity of the Association.

More Vigilance Needed.

THE Mill River catastrophe is another illustration of the recklessness which is said to characterize Americans in regard to the safety of life and limb, or rather the absence of a system of inspection for determining the strength of materials and the capacity of structures to resist the strains to which they are subjected. A bridge breaks down, a boiler bursts, a building falls, a ship goes to the bottom, or a reservoir is let loose, causing a fearful destruction of life and property, and then it is immediately discovered that a little timely attention would have prevented the mischief. Machinery rarely breaks, and walls seldom give way, without some premonitory warning which careful observation would not fail to notice. The trouble is, there is no one whose supreme and peremptory duty compels them to make such observation. Government inspection is better perhaps than none at all, so far as it goes. It is official and formal, and made at long intervals; while an inspection to be really worth any thing should be unremitting, inspired by a sense of duty and a solicitude for personal safety. The habit of assuming that because a structure has stood a certain initial test, it will always stand, or that a machine once built, is good for all time, must be broken up, and some reliable system of inspection adopted in its place. Unceasing vigilance on the part of owners and employees, if it is intelligent and discriminating, is worth more and would save more than a whole army of official inspectors.

Such a system, however, is not likely to become established very extensively or permanently so long as it depends on the voluntary action of individuals. There must be more thorough legal investigation into the causes of accidents, and severer penalties imposed for neglect and carelessness. Owners and subordinates would then realize their accountability. The first would become more critical and exacting in whatever concerns the safety of life, and would exercise greater care in the selection of employees as to sobriety, intelligence, and fidelity; while the eyes and ears of the latter would be more observant of every sign of danger, however trifling or insignificant. It would beget thoughtfulness as a habit of mind, contribute greatly to the safety of themselves and others, and diminish the number of accidents which now make such a fearful catalogue every year.

The Situation in the North-west.

THE prospect of an early reconciliation of railroad and agricultural interests in the North-west is not flattering. The breach, instead of closing up, appears to widen. A popular sensitiveness on the subject of railroad monopolies has been stimulated by the "Grange" movement until it has culminated in arbitrary, inconsiderate, and one-sided legislation, designed to favor one interest exclusively at the expense of the other. The Wisconsin law which took effect on the first of last month, assumes to regulate the railroads of that State by cutting down their rates of transportation so as barely to cover operating expenses, with no chance for earning interest or dividends. It may be that railroads do in some cases require close watching, but whatever is done in this direction should be done wisely. Investigation should precede legislation, and not follow it. Crude estimates and figures taken at hap-hazard by men who know nothing of the cost of operating roads, are an utterly unreliable basis for a fair freight tariff, and all such attempts to regulate railroads can only result in paralyzing trade and retarding the growth of the State by driving foreign capital from its borders. The present war is suicidal in its character, so far as it affects local development. The real situation—the actual relations which the hostile interests sustain toward each other as constituting a political community, will have to be recognized at last. No statutory enactments can regulate the winds or the tides, or abolish the multiplication-table, or make water voluntarily run up-hill. The commercial growth and prosperity of the West can not be manufactured to order by mere legislation. If it could, all the discords of society and collisions of interest in the business world could be rectified in the same way. The farmers must learn—and they certainly will learn if they live a year or two longer—to respect facts and figures, especially those which express the relation between railroad expenditures and receipts. They must understand that there is such a thing as over-production, and that if the rates of transportation to distant markets are hard to pay, they are not necessarily excessive or unreasonable.

State interference in the form of unjust and oppressive laws dictated by ignorance and prejudice, is a two-edged weapon, especially if it meddles too much with details and reserved individual rights. It may cripple the roads for a time, but the State as a community is bound to suffer also. Emigration, capital, and enterprise will not be attracted to a region where the natural channels of communication are obstructed, and industry rendered unproductive. Mere experimental legislation is expensive and ruinous when it tampers with such vital interests. The people of the West are beginning to see this, as well as the necessity of speedily undoing what had better have been left undone. Little by little they are feeling their way toward a proper understanding of the problem, and its settlement by a code of laws based on a just regard for the rights of all concerned. In resisting the oppressive and obnoxious laws which have recently been enacted, and which are pronounced constitutionally invalid by some of the ablest jurists of the land, the railroads have the inside track. They are sure to be sustained in the court of last resort; and as respects any hostile demonstrations by the people along their respective lines, it is quite within their power and the scope of their legal rights, to furnish insufficient trains, avoid stopping, or in other ways bring malicious persecutors to terms. The "Grange" element of the West must think more, cultivate a more familiar acquaintance with facts and statistics, and it will hardly fail to discover that there is no infallible short cut to prosperity, that cause and effect still sustain the same old relationship, and that the farmer can no more make himself rich by imposing inequitable and impracticable rates of fare upon railroad companies than a trader can by marking up his goods.

Safety-Chains.

THERE is considerable difference of opinion among practical railroad mechanics as to the utility of these appendages as applied to cars, some believing them to be very serviceable in cases of ordinary derailment, by preventing the trucks from getting crosswise the track, while others deny that they are of any use whatever in such a contingency. These opposite views in regard to a matter which one would suppose could be definitely settled by test and observation, are somewhat remarkable, and can only be accounted for on the theory that those who disapprove of safety-chains require something more than mere hearsay and report to be convinced of their advantages. With them, seeing is believing; but in the absence of ocular demonstration, we think the question may be reduced to rather narrow limits by the statement of one or two simple propositions. We think it will be conceded that when trains run off the track, it is desirable to keep the wheels as much as possible on a line with the rails. We suppose it will also be conceded that the truck-frames can, by means of chains or other appliances, be so fastened to the body-sills as to keep the wheels in such position while running over the ties until the train can be stopped. These propositions seem to cover the whole ground as regards utility. An array of evidence showing how serviceable such chains have been in particular cases where they have been subjected to practical test, is well enough, perhaps, but it seems to us that, in the nature of the case, their usefulness and economy may safely be assumed.

It is not safe, however, to assume that all so-called safety-chains attached to cars are such in reality. Many of them are mere make-believes, a sort of ornamental attachment; but as reliable safeguards, utterly worthless. This is evident from a careful inspection of them, and would be still more evident if they were placed "under fire." What is wanted is an approved and thoroughly effective method of construction and fastening. It is not necessary for us to point out the numerous faults of present methods, nor could we do so satisfactorily without the aid of drawings. Suffice it to say that a chain-link of light and poor iron, eye-bolts with no hold on the wood except by the screw-threads, and their necks so formed as to break under a strain having no proportion to the strength of the sill, are merely a waste of labor and material. We trust that the committee of the Master Car-Builders' Association having this subject in charge will have an interesting report to present this month, and will designate therein a style of safety-chain, as regards material, construction, and application, that can be adopted as a standard, and recognized as an indispensable appendage to both freight and passenger-cars.

THE Gibson House has been selected as the headquarters of the master car-builders, at Cincinnati, during the session of the convention, and College Hall as the place where the association will convene. A room in the immediate vicinity has also been procured for the exhibition of models, machinery, etc.

An Important Patent Decision—The Rubber Centre Spiral Spring.

DURING the past two years, a suit has been pending in the United States Circuit Court for this District, involving the validity of the reissue of a patent to the National Spring Company, of New-York, for an improved India-rubber and steel spring, or what is generally known as the rubber centre spiral car-spring. The suit was brought by the said company against the Union Car-Spring Manufacturing Company and the New-York Car-Spring Company, for an infringement of the patent, and after a full and exhaustive trial, a decision has at length been rendered, affirming the validity both of the original patent and of the reissue, in the most unequivocal manner. The defense was vigorously prosecuted, and involved an examination of all patents, both American and foreign, as well as springs, whether patented or otherwise, that were thought to be in any respect analogous, and the result is that the priority of the invention is conclusively established. The opinion of Judge Blatchford is very voluminous, and covers the whole ground of the attempted defense, sustains the patent at every point, holds the defendants to be infringers, orders an injunction to issue against them forbidding the farther manufacture of said springs, and directs an accounting and recovery of damages for past infringement. It should also be specially noted that under this decision the exclusive right to manufacture, use, and sell springs composed of a steel spiral coil, with a column of rubber placed within the coil (whatever may be the form of the rubber), is secured to the National Spring Company; and all parties making, selling, or using such spring without license, are infringers, and liable to payment of damages.

The suit was prosecuted by J. P. Fitch, Esq., attorney for the National Spring Company, and defended by C. H. Woodruff, Esq., for the companies aforesaid.

This spring has for years past been extensively used by the leading railroads of the country, and has been supplied by Vose, Dinsmore & Co., as the representatives of the National Spring Company. As soon as it became evident that an infringement was contemplated by the defendants in this suit, the National Spring Company, by means of circulars issued in divers forms and at various times, gave ample notice to all parties who were likely to become vendors or users of the article, of the rights claimed under the patent, and of

its intent to institute legal measures for their vindication. Such notice, however, has not prevented the unwarranted manufacture, sale, and use of such springs in large numbers; and owing to the fact that they were of an inferior quality as compared with the original standard quality established by the National Spring Company, the reputation of the spring was thereby impaired, and a double injury inflicted on the business interests of the rightful manufacturers. They have in many cases been used by parties who have been notified that they were an infringement, or who have considered themselves sufficiently protected by guarantee of indemnity from the manufacturers, but who are, nevertheless, equally liable as infringers.

In the face of this decision, however, so fully and clearly confirming the rights of the complainants, and rendered after a thorough and prolonged investigation, and with ample opportunity afforded to the contestants to invalidate the patent, there will exist hereafter no warrant for further infringement by the using of any springs of this description which are not manufactured and sold by the National Spring Company, or by Vose, Dinsmore & Co. as their representatives.

Fast Traveling on Poor Railways.

If a railway were perfectly smooth, even, and straight, and if the line of draught of carriages passed directly through their centres of gravity, there would be no derailments. Indeed, with perfectly cylindrical tires, and a perfect equality of resistance at every point, flanged wheels would not be required, except to provide for the action of the wind, because there would be no reason why a train, once set fairly on the rails, should be induced to leave them. In practice, however, there is no such thing as a perfectly even and smooth line of rails; the centre of tractive effort does not coincide with the centre of gravity; there are plenty of curves to be run over, and, in short, the road and the rolling-stock are both far removed from perfection. Now, all railway men will agree with us when we state that whether a train keeps on the rails or resorts to the ballast instead, at any given speed, is purely a question of the good and bad qualities of the road and the rolling stock. For example, there are tracks to be found, even in England, over which it is not safe to travel at more than ten miles an hour, and there are also tracks over which we should be quite content to risk our lives at 100 miles an hour. Between these limits there are all kinds of roads, which may be classed as 20 mile, 30 mile, 40 mile an hour tracks, and so on.

In like manner, there are 20 mile, 30 mile, 40 mile, even 70 mile an hour engines and carriages. If a road were all of the 20 mile, or all of the 40 mile type—of any fixed type, indeed, throughout—the work of running trains would be much simplified and the risk of derailment would be much diminished. As a fact, however, in the middle of a length of, perhaps, 100 miles of 45 mile an hour permanent way, we come upon a mile or two of 20 mile an hour road. Over this trains run for years, and safely, apparently at least. No one knows how bad the bad bit is but the driver—there is nothing like standing on a footplate to know where a rough mile comes in. At last it so happens that a 20-mile carriage comes at 45 miles an hour on to the 20-mile bit of road. Then comes derailment, and a coroner's inquest, and a board of trade inquiry, and the road is examined, and said to be very good, and the engine-driver is examined, and he says he can't explain it, and the stoker knows nothing about it—stokers never do, *vide* coroner's inquests.—*Van Nostrand's Magazine.*

The Morris and Essex Division of the Delaware, Lackawanna, and Western road is to have a new freight-house, 75 x 400 feet, at Hoboken. The building will have two stories, the upper one being used for offices and store-rooms. The old freight-houses will be torn down, as will the round-house and machine-shop and some of the coal-trestles. A new round-house will be built just beyond the end of the present yard, and the shops will be moved to Kingsland, the first station on the Boonton Branch, where new buildings are now nearly finished and ready for use. No change will be made in the passenger-depot until the new tunnel is finished, when a permanent depot will be put up and slips built for the new ferry. The new freight-house is to be built at once, and will, it is expected, be finished by September next.

Previous to September last, the Baldwin Locomotive Works were employing 2800 men and producing at the rate of 500 engines annually; the average monthly wages were $163,219. This year, only 1400 men are employed, and those on three-quarters time, and the production has been at the rate of 160 engines annually; the average monthly wages are $53,027. In 1873, the whole number of locomotives turned out was 437, of which 96 (22 per cent) were for foreign markets and 341 for home use. In the first three months of 1874, there were built 40 locomotives, of which 27 (67½ per cent) were for export and only 13 for home use.

A bill is pending in the Massachusetts Legislature, requiring that all railroad companies of that State shall prescribe a certain form of cap and badges to be worn by all their employees whose duties relate to the immediate transportation of passengers or their baggage. The companies are required to furnish the caps and badges, and the act is made to apply to street-car railways as well as to steam railroads. The corporations are to be fined for neglect to furnish the caps and badges, and no employee is to be permitted to exercise any authority over passengers or their luggage unless he is at the time wearing his official cap and badge.

A Paris paper announces the arrival of a Pullman car recently in France, and that an experimental trip was made with it on the Northern Railroad between Paris and Creil, on a special train, organized by the agent of the Pullman Company, in order to make French railroad men acquainted with the modern sleeping-car. This interesting exhibition enabled the managers of the principal railways of France to ascertain for themselves the degree of comfort which this style of car, uniting all the improvements suggested by a practical experience of many years, affords to travelers. The experiment was conclusive, and we have full confidence that this system will meet with the same favor that it has won in England.

The lease of the Atlantic and Great Western Railway to the Erie Company was completed May 8th. The Atlantic and Great Western is taken just as it stands, with its rolling stock and all its appurtenances, and is to be run and managed by the Erie management. The rent for the road, rolling stock, and every thing is to be thirty per cent upon the gross receipts, leaving seventy per cent for running expenses. If, however, the new management shall at any time succeed in reducing the running expenses so as to leave a margin of profit between the same and the thirty per cent of rent, that margin is to be equally divided between the two parties. The lease is for one hundred years.

James Montgomery has been chosen President, George Cohen Vice-President, Harlan H. Peck Secretary, J. W. Montgomery Treasurer, and Edwin O. Fowler, Superintendent of the Montgomery Palace Stock Car Company, of Chicago, a new corporation which has purchased the Street and Hugh Lee patents, and now purposes to sell rights to railroad companies for the construction and use of a stock car with adjustable stalls for carrying live stock in such a way that they can be fed and watched on the road.

The Atlantic and Great Western, Ohio and Mississippi Railways have just finished a hoisting machine at Cincinnati for changing the broad-gauge trucks, and placing under the cars the narrow-gauge trucks of the Ohio and Mississippi Railway, which will be done with only six minutes' detention of passengers, enabling the line to run through coaches to St. Louis without change. The coaches to be run in the through St. Louis line are the Morning Star, Avon, Nebo, Evening Star, Corning, Gilead. They are without doubt the finest and most luxurious specimens of railroad architecture in the world, much more roomy and comfortable, and supplied with appointments which are incomparably superior to those possible in cars of less space.

The annual meeting of the Railroad Association of the United States was held in Indianapolis May 13th. Various subjects of general interest came before the session, among others the report of a committee appointed last year to take action upon the formation of a bureau, to include the compiling of statistics upon the running expenses of railways, and such variety of other information upon railway management as will be of general benefit to all the corporations.

The works of the Allegheny Car and Transportation Co., at Swissvale, Pa., are now in operation. The erecting shop is 220 x 75, and will hold 20 large passenger-cars. The machine-shop is 126 x 75; the engine, boiler, and tank-rooms are in a building 50 x 24, and the blacksmith-shop is 112 x 50. The officers of the company are Hon. Alex. L. Russell, President; S. M. Kier, Treasurer; John B. Stewart, Secretary; and John C. Paul, Manager.

The trains on the New-Jersey lines of the Pennsylvania road have always run on the left-hand track, where there is a double track, but are hereafter to run on the right-hand track, as on the Pennsylvania lines. Considerable work is to be done in changing switches, moving watering-tanks and cranes, and rearrangement of depots, and the change in running will probably not be made before June.

The Pullman Palace-Car Company are putting Cobb's patent spring mattresses on a large number of cars of the company's central division, which comprises those running south from Jersey City. We are informed that these mattresses are already in use upon upward of 500 cars.

In anticipation of the coming convention at Cincinnati, there was but a small attendance at the Association rooms in this city on the evening for the May monthly meeting. No organization or formal discussion took place.

Side-Bearings.

To the Editor of The National Car-Builder:

Dear Sir: I notice in your last issue a cut and description of what is claimed to be an improved side-bearing for freight and passenger-cars. So far as I can see from a careful examination of the same, it is similar in all respects to those used several years ago on the road with which I am connected; and with your permission, I will state the results of my experience with them. About ten years ago, we built 60 box and 20 flat cars, and put under them exactly the same side-bearings as the one described. They proved to be a failure, from the fact that the rollers being made tapering and the friction-plates beveled to correspond with them, the car rested practically on two wedges. This produced a tendency to crowd the rolls outward or farther from the centre-plate, and also to increase the friction on the ends of the rolls to such an extent as to prevent their turning. This very naturally caused a large proportion of them to wear flat, and in some instances the bolts would give way and the chair or frame be pushed out of place. After two or three years of trial, I took the rolls out and put in straight ones with level friction-plates, retaining the curved chair (which I think is right), and have since had no trouble. There is no tendency of the rolls to wear flat, and the trucks will turn the shortest curves with no more danger of climbing the rail than attends the running of any other cars.

This is my experience with this kind of side-bearing. If the same results do not attend the use of the one you describe, there must be some peculiarity about it which does not appear in the description. We ought to have a standard pattern which should be as near faultless as possible, and to that end it is desirable to have the views and experience of every

CAR-BUILDER.

Car Ventilation.

TO THE EDITOR OF THE NATIONAL CAR-BUILDER:

DEAR SIR: Americans are perhaps more than any other people fond of traveling, and whatever tends to promote the comfort and convenience of locomotion is sure to be appreciated. Our railway-cars are provided with most of the essentials to make a journey agreeable at any season of the year, but there is still room for improvement, and especially in the two important items of heating and ventilation. In regard to the former, I shall offer no suggestions, my purpose at present being to call the attention of your readers, and especially of Western car-builders, to a very effective method of ventilation which has been introduced on several of the New-England roads. My attention was first attracted to this device a few months ago, while traveling on the Connecticut River Railroad. On entering a car at Springfield, I found it filled with the smoke which had been driven in through an open door on the windward side. Not relishing this, I tried another car, and found it in the same condition, but concluded to make the best of it. I took my seat, expecting to be very uncomfortable for an hour or so, as my eyes were peculiarly sensitive to smoke; but much to my surprise and satisfaction, as soon as the train started the smoke disappeared in an incredibly short time. This very naturally directed my attention to the ventilators, and their method of working. They were the Hitchcock patent, and are placed, like many others, in the roof. They are arranged so that each alternate one supplies and exhausts the air. They are also self-adjusting and noiseless, and when once in place require no further attention. The motion of the car forces the air into the mouths of the supply ventilators, and then into the car through a lateral opening, the dust and cinders being intercepted by a shield and thrown to the bottom of the box, where they are forced out through an opening provided for the purpose. The greater the speed of the train, the more thorough the ventilation, while the passengers are protected from any direct draught. The ventilators are manufactured by H. D. Carroll & Co., of Springfield, Mass., and are sometimes called the Carroll ventilator.

ENGINEER.

ROPER'S HAND-BOOK OF THE LOCOMOTIVE.—This little volume contains, in convenient pocketbook form, a great quantity of valuable information for the guidance of the practical locomotive engineer. It is not encumbered with formulas or mathematical problems, but embodies in simple language and compact arrangement a description of the various parts and functions of the locomotive-engine, with instructions for its care and management. There are articles on heat, combustion, water, gases, etc., the details of construction, a vocabulary of terms, useful tables, illustrations, and practical hints, suited to the daily needs of the engineer. The work can be had of the publishers, Claxton, Remsen & Haffelfinger, 624 Market street, or of Stephen Roper, the author, 447 North Broad street, Philadelphia.

ROPER'S CATECHISM OF STEAM-ENGINES.—This is also an illustrated hand-book of the same size and form as the one above noticed, and may be had of the same parties. It contains a description of the various kinds of high-pressure or non-condensing engines, with valuable suggestions in regard to their construction and management, illustrated by diagrams and useful tables. As indicated by the title, the contents are arranged in the form of question and answer, which renders the work all the more attractive, while it conveys with equal clearness the practical information required by those intrusted with the care of engines.

NOYES' PATENT LIQUID PACKING.—This preparation for cooling hot journals is strongly indorsed by leading railroads that have used it for the past two years. It is applied by pouring it on the heated journal so as to cool it down, the waste being pushed away so as to bring the liquid as much as possible in contact with the journal. If there is any fire, a free application of the liquid will extinguish it. The proprietors warrant the preparation to do this, and will send a barrel of it to any road for trial, with no charge for same if it fails. They also furnish the liquid in a form suitable for mixing with other oil, which they claim will increase its value from 20 to 40 per cent according to size of journal and quality of oil with which it is mixed. See advertisement.

DEVLAN'S PATENT ELASTIC WASTE.—This article is specially designed for railroad car journal-boxes, and is the result of prolonged experiment with the view of preventing hot journals. It is incombustible, wears three or four times as long as ordinary waste, keeps up to the journal, does not pack or grind into mud, and requires one third less oil. Numerous testimonials of railroad men who are using it on their cars concur in recommending it as very effective in preventing hot boxes, saving brasses, reducing friction, and economizing traction power. Manufactured by the Elastic Waste Company, office 60 Broadway, New-York.

THE ZERO REFRIGERATOR, manufactured by Alex. M. Lesley, 224 West Twenty-third-street, New-York, furnishes housekeepers with the means of preserving food in perfect condition and securing at the same time a constant supply of ice-cold water. The water from the melted ice, instead of being thrown away, is utilized for ordinary purposes; the flavors of the different kinds of food are kept separate by means of air-tight compartments; a temperature very little above freezing is maintained; the water from condensation constantly removed, and the interior of the refrigerator kept clean and dry. For securing wholesome food and pure water it is the most effective appliance yet invented. See advertisement.

Facetiæ.

"Do you retail things here?" asked an inquisitive-looking customer as he poked his head into the door of a dry-goods shop. "Yes," was the reply. "Well, I wish you would re-tail my dorg; he had it bit off about a week ago."

"Warts on the mind!" exclaimed Mrs Partington the other day, as she glanced into a library through her dim spectacles. "I have heerd of warts on all parts of the human cistern, but never before on the mind. O dear! I should think it would defect the brain."

An Irishman going from Boston to Lowell in the early days of railroading, took the stage in preference to the cars, because, as he said, he could ride four times as long for the same money.

"Well, my good fellow," said a victorious general to a favorite soldier after a battle, "and what did you do to help us gain the victory?" "Do, may it plase your honor, why I walked bouldly up to one of the inimy and cut off his fut." "Cut off his foot! Why didn't you cut off his head?" "Ah! and faith, yer honor, that was off already."

Mosquitoes are large and somewhat ferocious in some parts of Mississippi. A man who went out one day to look for his cow, found her skeleton on the ground, and on an adjacent tree sat a huge gallinipper, picking his teeth with one of her horns!

An irascible old gentleman who formerly held the position of justice of the peace, was recently accosted in the street by a youth in a manner that did not come up to his honor's idea of the respect due him. "Young man," said he, "I fine you twenty shillings for contempt of court." "Why, judge," said the offender, "you are not in session." "This court," replied the judge, thoroughly irritated, "is always in session, and consequently always an object of contempt."

A down-easter at a Wisconsin hotel, was making a desperate effort to dissect a piece of tough beef with his knife and fork, much to the amusement of the other guests. "Strangers," said he, "you needn't laff—if you ha'n't got no regard for the landlord's feelings, you orter have some respect for the old bull!"

"TICKET, sir!" said a conductor at a railway terminus in the city to a gentleman, who having been a season-ticket holder for some time believed his face was so well known that there was no need for him to show his ticket. "My face is my ticket," replied the gentleman, a little annoyed. "Indeed!" said the conductor, rolling back his wristband and displaying a most powerful fist, "well, my orders are to punch all tickets that pass this platform."

AN inebriate stranger precipitated himself down the depot-stairs, and on striking the landing, reproachfully apostrophized himself with, "If you'd been wanting to come down-stairs, why didn't you say so, you wooden-headed old fool, an' I'd a come with you an' showed you the way."

A REGULATION black and tan poodle, to be worth $100, must have a head about the size of a black-walnut, eyes that stand outside of their sockets, a tail about the size of a lead-pencil, and legs so attenuated that the animal falls over on his back every time he lifts his head to bark.

"I WOULDN'T be a cook for the whole world!" exclaimed a fashionable young lady to her betrothed lover. "Of course not," he replied. "If you were to cook for the whole world, you would never get through your work; but you'll be able to manage it nicely for our little family."

A LITERAL-MINDED youngster was picked up by a visitor of the family, who, dandling him on his knee, said, "I wish I had this little boy: I think there's money in him." To which promptly responded the child, "I know there is; for I swallowed a cent when I was at grandma's the other day."

"LOOK here, Pete," said a knowing darkey to his companion, "don't stan' on the railroad." "Why, Joe?" "Kase, ef de cars see dat mouf of yourn, dey will tink it am the depo', and run rite in!"

AN East-Tennessee woman waved a red flag till a train stopped, and then asked the conductor if her sister was aboard.

AN Indiana man was bitten by a rattlesnake about twenty years ago, and he still keeps taking whisky to cure the bite.

A PASSENGER by rail, aroused from a serene slumber by the tooting of a whistle, exclaimed, "The train has caught up with those cattle again."

WHAT did the cat say when it looked through the window of Noah's ark, and saw dry land? *Is that are a rat?*

"AND so they go," said a member of a Boston school committee, "our great men are fast departing—first Greeley, then Chase, and now Sumner—and I don't feel very well myself."

"OFF she goes!" said a lady, speaking of the train as it was starting. "You have mistaken the gender," said a gentleman, "this is a mail train."

AN incorrigible loafer, being taken to task for his laziness, remarked, "I tell you, gentlemen, you are mistaken. I've not got a lazy bone in my body; but the fact is, *I was born tired.*"

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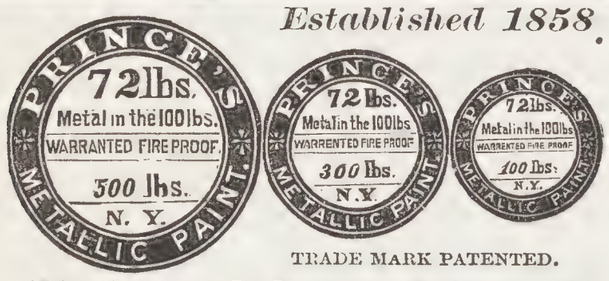

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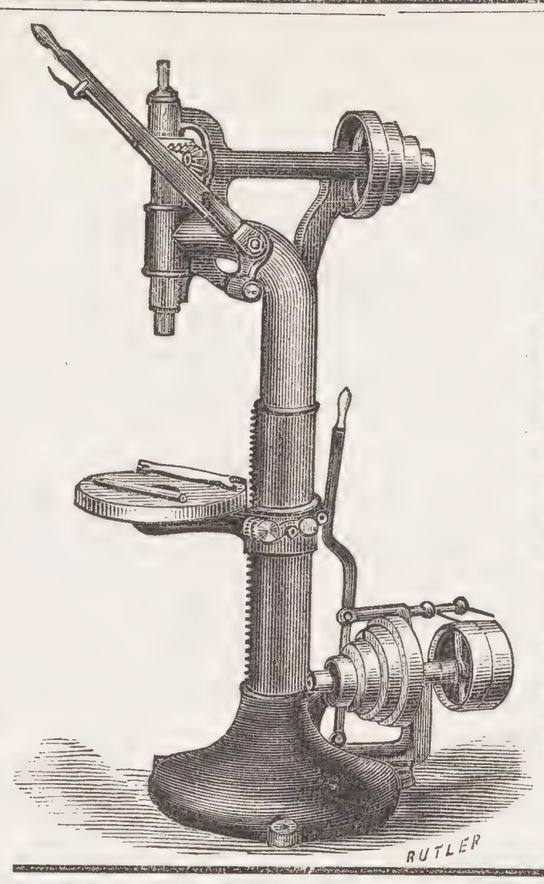

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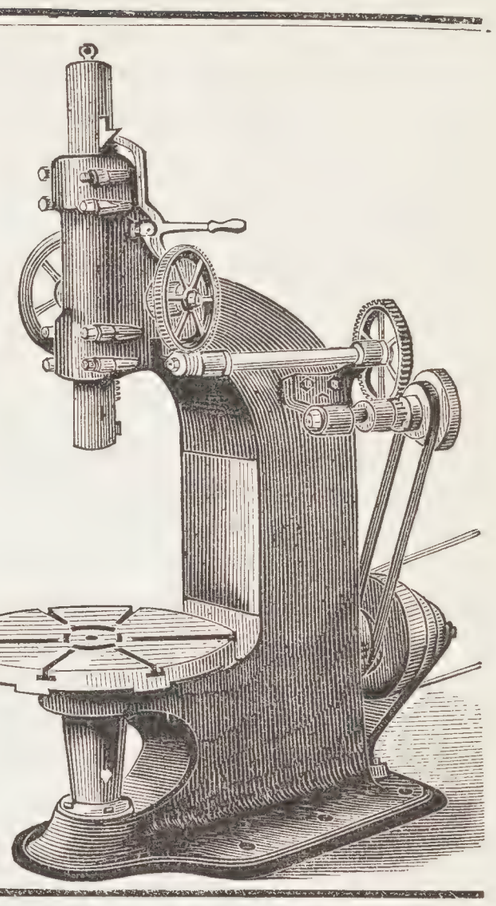
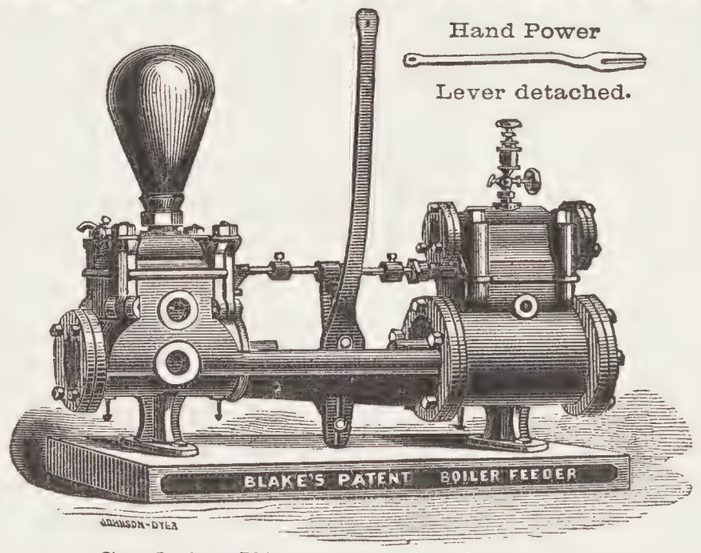


BLAKE'S PATENT STEAM PUMPS.



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TRADE ELASTIC MARK
H.S.A
WASTE.

DEVLAN'S PATENT ELASTIC WASTE,

It being composed of Incombustible and Lubricating Materials, "Hot Journals" are impossible where the Waste is properly used.

Certificates from Railroad Officials, showing its very decided advantages, are herewith annexed—namely:

PENNSYLVANIA RAILROAD—NEW-YORK DIVISION, JERSEY CITY, July 11, 1873.

GEO. W. BARKER, ESQ., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872, I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, ESQ., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your resquest herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, ESQ., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

OFFICE, ELASTIC WASTE COMPANY, No. 60 BROADWAY, NEW-YORK.

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Anderson, J. R. & Co.....Richmond, Va.
Allegheny Car & Transportation Co.....Swissvale, Pa.
Altoona Manufacturing Co .. ..Altoona. Pa.
Adrian Car Co.... ....Adrian, Mich.
Arlington Car Manufacturing Co.....Arlington, Vt.
Barney & Smith Manufacturing Co.....Dayton, Ohio.
Baker, Jackson & Co.....Latrobe, Pa.
Bellefonte Car Manufacturing Co.....Bellefonte, Pa.
Billmeyer & Smalls..... .....York, Pa.
Bradley, Osgood.....Worcester, Mass.
Bridgeport Car-Works..... .....Bridgeport, Pa.
Brill, J. G. & Co.....Philadelphia, Pa.
Buffalo Car Co..... .....Buffalo, N. Y.
Canada Car Co ..... Toronto, Canada.
Canada Steam-Engine Co..... Kingston, Canada.
Canda, F. E. & Co..... ..... Chicago, Ill.
Cartersville Car Co .....Cartersville, Ga.
Central Car & Manufacturing Co.....Jackson, Mich.
Clendenning, W. W..... .....Montreal.
Cummings Car-Works.....Jersey City, N. J.
Connellsville Machine and Car Co.....Connellsville, Pa.
Corunna Car Co... .....Corunna, Mich.
De Pere Iron-Works.....De Pere, Wis.
Detroit Car-Works.....Detroit, Mich.
Detroit Car and Manufacturing Co.....Detroit, Mich.
Dawson Manufacturing Co.....Dawson, Ga.
Dickey, Neill & Co.....Toronto.
Dickson Manufacturing Co.....Scranton, Pa.
Erie Car-Works.....Erie, Pa.
Elmira Car-Works.....Elmira, N. Y.
Frederick & Co.....Catasauqua, Pa.
Freas Brothers & Thornton.....Berwick, Pa.
Fremont Car Co.....Fremont, Ohio.
Gardner, F. & Co. ....Carlisle, Pa.
Gill, John L.....Columbus, Ohio.
Gilbert, Bush & Co..... ..... Troy, N. Y.
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Goodrich Car Co..... ....Augusta, Ga.
Hannibal Car Works .....Hannibal, Mo.
Haskell & Barker Car Co.....Michigan City, Ind.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Heathcote, Herbst & Co..... ...Glen Rock, Pa.
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Harlan & Hollingsworth Co.....Wilmington, Del.
Herrick Car-Works... .....Oswego, N. Y.
Huntingdon Car-Works.....Huntingdon, Pa.
Indiana Car Co... .....Cambridge City, Ind.
Indianapolis Car Co..... .....Indianapolis, Ind.
Jackson & Sharp Co .....Wilmington, Del.
Jackson & Woodin Manufacturing Co....Berwick, Pa.
Jones, J. M. & Co..... .....West-Troy, N. Y.
Kimball Manufacturing Co.....San Francisco, Cal.
Keith, H. T. & I. N..... .....W. Sandwich, Mass.
Laporte Car Manufacturing Co.....Laporte, Ind.
Lombard, Thomas.....Augusta, Me.
Lebanon Manufacturing Co..... ..Lebanon, Pa.
Lehigh Car Manufacturing Co.....Stemton, Pa.
Litchfield Car Manufacturing Co.... ..Litchfield, Ill.
Mansfield Machine-Works.....Mansfield, Ohio.
Michigan Car Co..... .....Detroit, Mich.
McNairy, Claflen & Co..... .. Cleveland, Ohio.
Murray, Dougall & Co.....Milton, Pa.
McVay, Walker & Co.....Braddock's Field, Pa.
Mowry Car and Wheel Works..... ..Cincinnati, O.
Middletown Car & Manufacturing Co.....Middletown, Pa.
Missouri Car and Foundry Co.....St. Louis, Mo.
Myers, H. S. & Co. (small cars).....York, Pa.
New-Haven Car Co..... .....New-Haven, Ct.
Niblo, James M.....Conshohocken, Pa.
Northumberland Car & Mfg. Co... .....Northumberland, Pa.
Ohio Falls Car Co..... ....Jeffersonville, Ind
Ontario Car Co..... .....London, Ont.
Oxford Co-operative Car Co..... .. ..Oxford, Pa.
Patten Car-Works.....Bath, Maine.
Peabody & Crangle Bro's .....Calais, Me.
Peters, Simon.....Quebec.
Petersburg Car Co... .....Petersburg, Va.
Piqua Car and Agricultural Works.....Piqua, Ohio.
Pittsburg Car-Works.....Pittsburg, Pa.
Pittsburg and McKeesport Car Co.....McKeesport, Pa.
Pittsburg Car and Locomotive Co .....Pittsburg, Pa.
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Ranlet Car Manufacturing Co..... .Laconia, N. H.
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Schall, Michael..... .....York, Pa.
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Shaaber & Johnston .. ..Reading, Pa.
Southern Car-Works. .....Independence, La.
South-Western Car Co.....Jeffersonville, Ind.
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Seath & Hager..... .....Terre Haute, Ind.
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Stephenson, John & Co.. .... New-York, N. Y.
Star Mining & Manufacturing Co.....Henderson, Ky.
Taunton Car Co.....Taunton, Mass.
Tredegar Co ....Richmond, Va.
Tiffin Car-Works.....Tiffin, Ohio.
Vigo Foundry and Terre Haute Car-WorksTerre Haute, Ind.
Watsontown Car Co..... .....Watsontown, Pa.
Wharton, Thomas J.....Brunswick, Ga.
Whittaker, Phillips & Co ....Toledo. Ohio.
Wason Manufacturing Co.....Springfield, Mass
Weimer, P. L & Bros.....Lebanon, Pa.
Wyoming Valley Manufacturing Co... ...Wilkesbarre, Pa.
Wells, French & Co..... ...Chicago, Ill.
Wilmington Car-Works.....Wilmington, Del.

Car-Wheel Manufacturers.

Albany Car-Wheel Works.....Albany, N. Y.
American Paper Car-Wheel Co.....Hudson, N. Y.
Atlantic Iron-Works... ....Portsmouth, Va.
Baltimore Car-Wheel Foundry Co.....Baltimore. Md.
Barnum & Richardson Manufacturing Co..Chicago, Ill.
Barney & Smith Manufacturing Co. .....Dayton, Ohio.
Bass & Hanna..... .... Fort Wayne, Ind.
Bailey, Howson & Co.....St. Paul, Minn.
Blanchard & Arnold.....Milwaukee, Wis.
Boston Car-Wheel Co.....Camb'gep't, Mass.
Bowler, Mayer & Brayton..... ...Cleveland, Ohio.
Chicago Car-Wheel Co.....Chicago, Ill.
Davenport, Fairbairn & Co..... .....Erie. Pa.
Dawson Manufacturing Co.....Dawson, Ga.
Detroit Car-Wheel Works..... .Detroit, Mich.
Fulton Foundry Co.....Cleveland. Ohio.
Gill, John L. Jr..... .. ..Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co....St. Louis. Mo.
Hamtramck Car-Wheel Works.....Detroit, Mich.
Haskell & Barker Car Co .....Michigan City, Ind.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Heartt, Jonas S. & Co..... .....Troy, N. Y.
Jackson & Woodin..... .....Berwick, Pa.
John L. Gill..... .....Columbus, Ohio.
Lehigh Car-Wheel & Axle Works.....Catasauqua, Pa.
Lobdell Car-Wheel Works.....Wilmington, Del.
London Car-Wheel Co..... .....London, Can.
Louisville Car-Wheel & Railway Supply Co...Louisville, Ky.
Middlebrook & Mack..... .....Oswego, N. Y.
Missouri Car and Foundry Co.....St. Louis, Mo.
Mowry Car and Wheel Works..... .Cincinnati, Ohio.
Ohio Falls Car Co..... .....Jeffersonville, Ind.
Pettengill, Glass & Co.....Cleveland, Ohio.
Quealey, W. J..... ....Hannibal, Mo.
Ramapo Wheel & Foundry Co.....Ramapo, N. Y.
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Rutland Foundry & Machine Co.....Rutland, Vt.
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Tredegar Company..... .....Richmond, Va.
Toronto Car-Wheel Co..... .....Toronto, Can.
Washburn, Hunts & Co.....Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co.. ..Worcester, Mass.
Wason Manufacturing Co.....Springfield, Mass.
Whitney A. & Sons.....Philadelphia, Pa.
Woodbury & Company..... .....E.Cambr'ge, Mass.
Wyoming Valley Manufacturing Co..... ...Wilkesbarre, Pa.

Locomotive Builders.

Baldwin Locomotive Works .....Philadelphia, Pa.
Brooks Locomotive Works .....Dunkirk, N. Y.
Danforth & Cooke..... .....Paterson, N. J.
Dawson & Baily (light locomotives)..... .Connellsville, Pa.
Dickson Manufacturing Co..... .....Scranton, Pa.
Grant Locomotive Works.....Paterson, N. J.
Hinckley Locomotive Works.....Boston, Mass.
Manchester Locomotive Works.....Manchester, N. H.
Mason, William.....Taunton, Mass.
McKay Iron and Locomotive Works.....Jersey City, N J.
Portland Company.....Portland, Me.
Porter, Bell & Co. (light locomotives)... ...Pittsburg, Pa.
Pittsburg Locomotive Works.....Pittsburg, Pa.
Rogers Locomotive Works.....Paterson, N. J.
Rhode Island Locomotive Works..... ....Providence, R. I.
Schenectady Locomotive Works.....Schenectady, N. Y.
Taunton Locomotive Works.....Taunton, Mass.

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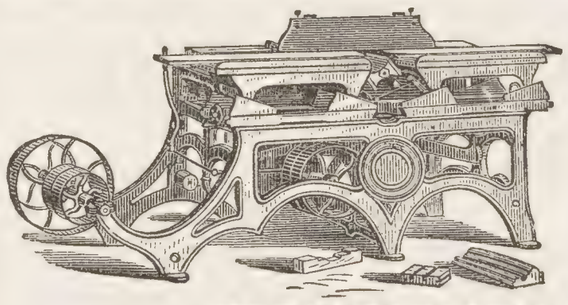

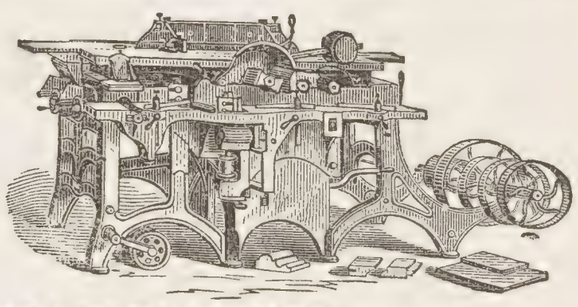

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A

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Albany & Susquehanna	R. C. Blackall	R. C. Blackall	Albany, N. Y.
Alexandria & Fredericksburg			Alexandria, Va.
Alexandria, Nebraska & Iowa	Geo. Q. Adams		Alexandria, Mo.
Atchison, Topeka & Santa Fe	H. V. Farris		Topeka, Kans.
Atchison & Nebraska	Selah Williams		Atchison, Kan.
Alabama & Chattanooga	T. H. Kennedy		Chattanooga, Tenn.
Atlanta & West-Point	Wm. Rushton		Atlanta, Ga.
Atlanta & West Point		R. D. Cole	Newnan, Ga.
Atlantic & Gulf	C. E. Van Vorst	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
Atlantic & Great Western		††J. H. F. Wiers	Meadville, Pa.
Atlantic & Great Western	William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Haggard	Cleveland, Ohio.
Atlantic & Great Western	‖J. B. Miller.	S. V. Smith	Kent, Ohio.
Atlantic & Great Western	Allen Cook.	J. W. Holmes	Galion, Ohio.
Atlantic & Pacific	§John Hewitt	E. Martin	St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South-Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
Allegheny Valley	G. W. Glass	R. Gunning	Pittsburg, Pa.
Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.

B

Baltimore & Ohio	§John C. Davis	J. S. Shryack.	Baltimore, Md.
Baltimore & Ohio		James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott		Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
Central Ohio Division	Alex. Platt		Zanesville, Ohio.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, Ohio.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Maine.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe.	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere Delaware	R. McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W.E.Chamberlain.	Allston, Mass.
Boston, Barre & Gardner	John Lover		Worcester, Mass.
Boston & Providence	George Richards.	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson.	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis.	Nashua, N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Blue Ridge			Anderson, S. C.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer.	Jacob Williams	Oil City, Pa.

C

California Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and branches	‡‡C. E Benton	††C. E. Benton	St.Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa.
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach.	Catasauqua, Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bossinger	Huntingdon, W.Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co.	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	C. H. Frazer	Columbia, S. C.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Wiscon. Mad. & Mill. Divis			Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender.	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch.	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan	W. H. Dunham,	Danville, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Divison	D. Carmichael.	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster. Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M.W. Dickerman.	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.

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Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	J. W. Sauerbach	Mt. Savage, Md.
Central of Georgia	D. D. Arden	C. C. Millar.	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas.
Central R. R. of Iowa	F. B. Woodruff	T. L. Seevers	Marshall, Iowa.
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.

D

Dakota Southern	Jas. Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. G. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co	James Dickson	Thomas Orchard	Carbondale, Pa.
Rensselaer & Saratoga Div			Troy, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G.Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.

E

Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East-Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
Elizabethtown and Paducah	W. D. Robb	T. A. Cordrey	Elizabethtown, Ky.
Erie Railway	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna, Pa.
Erie Railway	‖V. Blackburn		Jersey City, N. J.
Erie Railway	‖F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E. Cooper	W. E. Cooper	Hornellsville, N. Y.
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind

F

Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.

G

Galveston, Harrisburg & San Antonio	Jno. G. Coulon		Galveston, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	J. W. W. McWood.	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Sol. Bills	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman	T. M. Preval	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.

H

Harlem Extension	George W. Blanchard		Rutland, Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H. L. Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
Hempfield	T. Marsh		Wheeling, Va.

I

Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. T. Sanford	R. B. More	Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.

J

Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.

K

Kansas Central	John Davis		Leavenworth, Kan.
Keokuk & Des Moines Valley	Jas. Lamb	R. E. Smith	Keokuk, Iowa.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas	Chester, S. C.

L

Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey	E. R. Brown	South-Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson.	C.A.Thompson	Hunter's Point, L.I.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River, Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Macon & Western	D. M. Gogul	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta & Pittsburg	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	M. Thornton	M Thornton	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio
Memphis & Little Rock	Tho. Rennells	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis. Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Mississippi Central	Henry Gibbon	John E. Becton	Water Valley. Miss
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific	A. C. Stiles		Lincoln, Neb
Milwaukee & Northern		W. J. F. Liddell	De Pere, Wis.
Milwaukee & St. Paul		Wm. E. Kittredge	Milwaukee, Wis.
Milwaukee & St. Paul		John Baillie	Milwaukee. Wis.
Milwaukee & St. Paul	J. Pettee	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Jackson, Lans'g & Saginaw Div.			Jackson Mich.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard. Ala.
Mobile & Ohio	B. S. Skates	John McHugh I. T. Booth	Mobile, Ala. Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas	T. G. Gorman		Denison, Texas.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville. Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford.		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y.
New-York & Oswego Midland	‖Wm. H. Griggs	Wm. H Griggs	Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, Jackson & Gt. Northern	N. Greener	N. Greener	New-Orleans. La.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon. Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Northern	James W. Lander	Albert Langmaid	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	Jacob Williams	Oil City, Pa.
Oil Creek & Alleghany	H. J. Bookhammer	John Monks	Oil City, Pa.
Ohio & Mississippi		G. Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott	Chas. Hyatt	East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	J. D. Linning		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	John Hewitt	St Louis, Mo.
Pennsylvania	§§Frank Thomson		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	James F. Elder	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Ches[illegible] Pa.

Railroad.	*Master-Mechanic.*	*Mas'er Car-Builder.*	*Residence.*
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L. Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis			
Pittsburg & Columbus Division	E. Pierce		Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Pendleton, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns		Connellsville, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland. Me.
Port Royal	C. W. Furber	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village N H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Pou hkeepsie, N. Y

Q

Quincy, Alton & St. Louis	J. O. Grav l	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.

R

Raleigh & Gaston.			Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	H. Longest	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome. N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome. Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogul	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Seaboard & Roanoke	§A. Pendleton		Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Laughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Mames	W W. Peirce	Selma, Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N. Y.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon. Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.

T

Taunton Branch.	W. M. Parks	J. G. Codding	Taunton, Mass.
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	W. H. Hipple		Marshall, Texas
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn
Toledo, Wabash & Western	**G. W. Cushing	‖J. B. Morse	Fort Wayne, Ind.
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	‖James King		Springfield, Ill.
Toledo, Wabash & Western		‖U. H. Kohler	Toledo, Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha, Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Edward Cox	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vicksburg & Brunswick	James Boon	J. A. Knight	Eufaula, Ala.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia. Pa.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Coatesville, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria. Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H. Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss.		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A. Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	C. Hamilton		St. Louis, Mo.
Cairo & Vincennes	L. W. Palmer		Cairo, Ill.
Camden & Atlantic	E. Collings		Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*J S. Casement		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Sacramento & Oregon Division	J. A. Fillmore		Sacramento, Cal.
Western & Visalia Division	E. C. Fellows		Oakland, Cal.
Truckee Division	Frank Free		Wadsworth, Nev.
Humbolt Division	R. S. Mattison		Carlin, Nevada.
Salt-Lake Division	R. H. Pratt		Ogden, Utah.
California & Pacific Division	A D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart		Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡W. B. Strong		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota.	C. H. Hudson	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen		Chicago, Ill.
Chicago, Rock Island & Pacific.	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison.	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Pekin & Southwestern			Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams.	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati. Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron		Lafayette, Ind.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough		Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Akron, Ohio.
Colorado Central	T. E. Sickles		Golden, Col.
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin.	H. E. Chamberlin.	Concord, N. H.
Connecticut River	John Mulligan.	John Mulligan.	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer.	G. W. Bleashing.	Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst.	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer.	" "
Detroit, Hillsdale & Indiana	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese		Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer.	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western.	J. P. Farley		Dubuque, Iowa.

E

East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Elizabethtown & Paducah		D. Brock	Elizabethtown, Ky.
Elizabethtown & Paducah	D. F. Whitcomb		Louisville, Ky.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis. N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo. N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin.		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Haywood.	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw,Mich.
Florida Central	F. P. Papy		Jacksonville, Fla.
Flushing & North-Side	I. D. Barton		Hunter's Point, L.I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson		Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana.	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich
Grand Rapids & Indiana		William Mullins.	Pittsburg, Pa.
Grand Trunk		John Taylor	Montreal, Canada.
East Division	Henry Bailey		
West Division	W. J. Spicer		
Grand Tower and Carbondale	H. V. Olyphant.	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla.	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	William K. Muir.	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central.	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer.	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins.	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse.	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	S. Conant		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis.	Horace Scott	Wm. Mullins	Pittsburg, Pa.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth. Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Pacific	Edward S. Bowen		Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton.	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H Briggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs.	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound.		Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon.		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. H. Grant	Cleveland, Ohio.
Lake Superior & Mississippi.	G. H. Smith		St. Paul, Minn.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	E. O. Foote, Jr	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	J. C. Hadley		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Robert Meek		Clarksville. Tenn.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	M. Stanton		Birmingham, Ala.
Louisville, Cin. & Lexington	George Skinner	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.

M

Macon & Brunswick	William McRae	Solomon Hass	Macon, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta & Pittsburg	A. J. Warner	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	C. E. Van Cleve	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	A. S. Livermore		Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	H. E. Sargent		Detroit, Mich
Michigan Central		John Newell	Detroit, Mich.
Grand River Valley Division	Chas. Desmond		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	Geo. C. Hopper		Saginaw City, Mich.
South-Haven Division	Geo. E. Curtiss		Kalamazoo, Mich.
Joliet Division	Carlton Wheeler		Joliet, Mich.
South-Bend Division			
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	W. Elwell		Sheboygan, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Milwaukee & St. Paul	*S. S. Merrill	Rob't Wason	Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mississippi Central	R. N. Colquhoun		Water Valley, Miss.
Mississippi Central	*E. D Frost	S. H. Edgar, V. P.	New-Orleans, La.
Mississippi & Tennessee	M. Burke	M. Burk	Memphis, Tenn.
Mississippi Valley & Western	E. P. Buell		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas	F. W. Bowen	G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Holden, Mo.
Eastern Division	Mark M. Towne		Hannibal, Mo.
Sedalia Division	Mark M. Towne		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	L. J. Fleming	C. E. Rushing	Mobile, Ala.
	Cecil Fleming		Mobile, Ala.
	E. S. Hosford		Macon, Miss.
	M. M. Miller		Jackson, Tenn
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.

N

Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart	Tho. H. Little	St. Andrews, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, Jackson & Great Northern	*E. D. Frost	S. H. Edgar	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. M. Wilcox		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland	C. W. Douglas	P. Bundy	New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	A. R. Fiske		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.

O

Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	J. J. Lawrence		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.

P

Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania		Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	W. H. Brown		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pensacola & Louisville	L. H. Sellars		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Pittsburg & Cin. Division	George Webb		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Eastern Division	Richard Wiggin		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	S. C. Millett		Port Royal, S. C.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.

Q

Quincy, Alton & St. Louis	N. J. T. Dana	D. A. Sweet	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.

R

Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw		Richmond, Va.
Rockford, Rock Island & St. Louis	R. R. Cable		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.

S

St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St. Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. W. Gardiner	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	A. E. Shrader		Henderson, Ky.
St. Louis, Kansas City & Northern	W. C. Van Horne	R. W. Green	St. Louis, Mo.
St Louis Division	J. L. Hinkley		St. Louis, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V.	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	E. G. Barney		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Sheboygan, Wis.
Shenango & Allegheny	A. L. Dunbar		Meadville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern			Sodus Point, N. Y.
South-Shore	J. R. Kendrick		Boston, Mass.
South-Side, Long Island	L. S. Canfield		Brooklyn, N. Y.
South-Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern Minnesota	*H. W. Holley		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield & Ill. South-Eastern	G. W. Norris		Springfield, Ill.
Staten Island	J. W. Wlbur		New-York, N. Y.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Syracuse Northern	J. C. Belden		Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing	Syracuse, N. Y.

T

Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson	C. R. Peddle	Indianapolis, Ind.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble	J. F. Dixon	Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria & Warsaw	W. H. Cruger	Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio.
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.

U

Union Pacific	S. H. H. Clarke	T. E. Sickles	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City
Utica & Black River	T. W. Spencer		Utica, N. Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.

V

Vermont & Mass. & Troy & G.	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Vicksburg & Brunswick	Virgil Powers	H. Young	Eufaula, Ala.
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.

W

Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Wellsboro & Lawrenceville	A. H. Gorton		Corning, N. Y.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden. N. J.
Western of North-Carolina	John M. Rose		Fayetteville. N. C.
Western & Atlantic	Wm. McRae		Nashville, Tenn.
Western Maryland	John T. Rigney	John T. Rigney	Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	M. C. Conwell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn	J. H. Stewart	Madison, Wis.
Wisconsin Central	C. Harris		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner.	Worcester, Mass.

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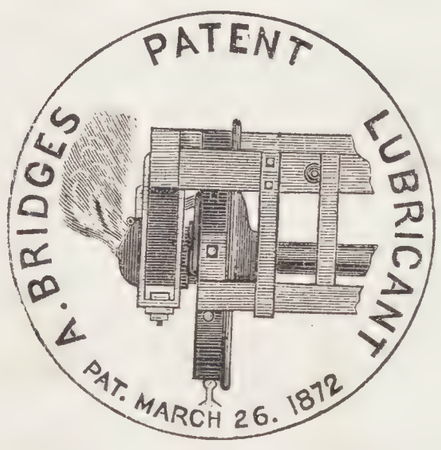

For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application

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WM. COURTENAY, President. CHAS. F. COBB, Secretary.

The Lock-Nut and Bolt Co., of New-York,

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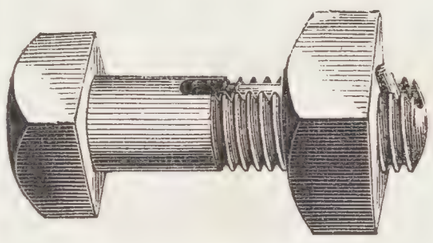
Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the

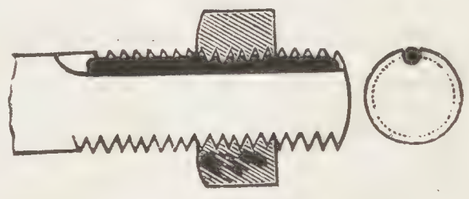


"CUMMING NUT-LOCK,"

Patented

June 16, 1868,

August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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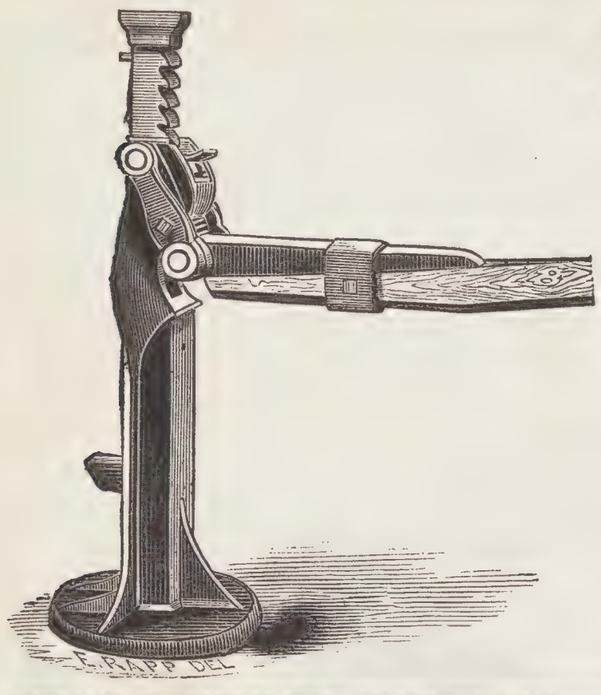

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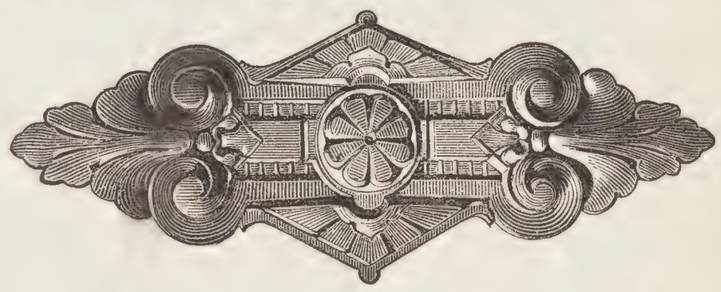

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To our variety of styles of ornaments, made to match black walnut in color, and which are perfectly fitted for use where not exposed to the weather. They have been sold extensively for several years, and have given entire satisfaction—so that all who have once used them have become constant consumers. They are artistic in design and unequaled in execution, being the production of the best artists, carvers, die sinkers, and moulders.

These ornaments hold glue and screws as well as carvings. They do not warp or crack. They are unaffected by changes of temperature, and withstand dampness as well as furniture. They will polish in every respect equal to wood, either with shellac, oil, wax, or varnish, and with less trouble, as there is no open grain to fill. They will gild or bronze beautifully by simply sizing, without any other preparation.

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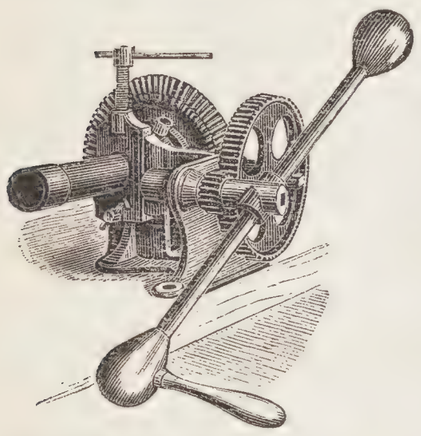
Pipe-Cutting and Threading Machine.

(W. D. CHASE'S PATENT.)



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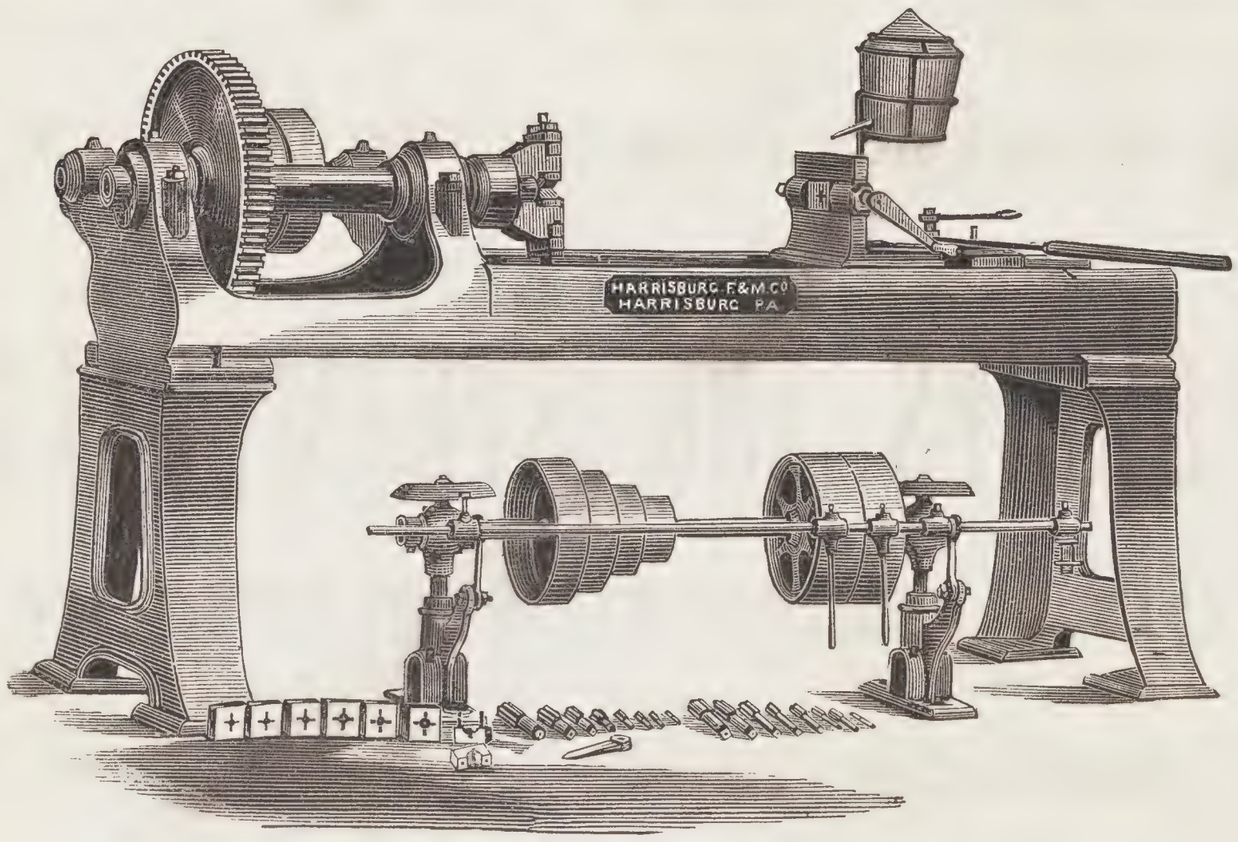

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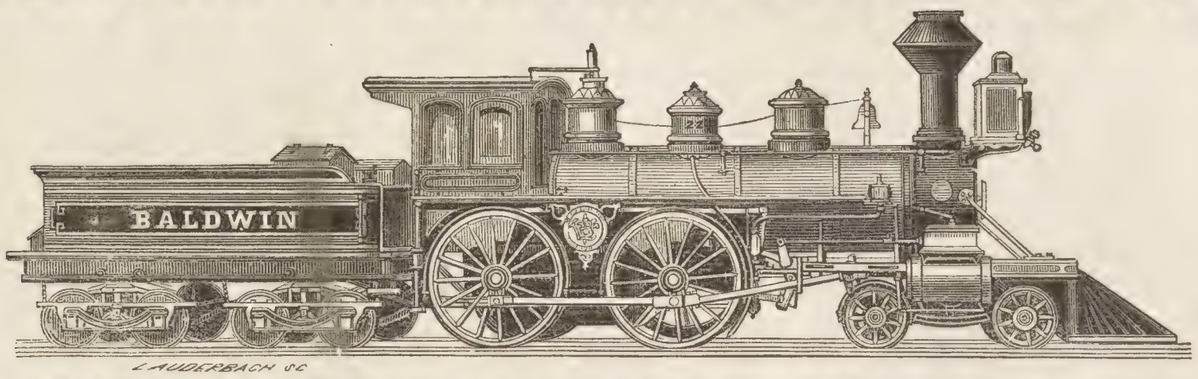

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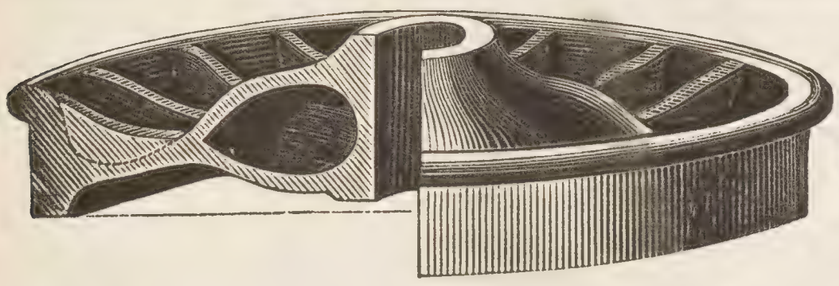

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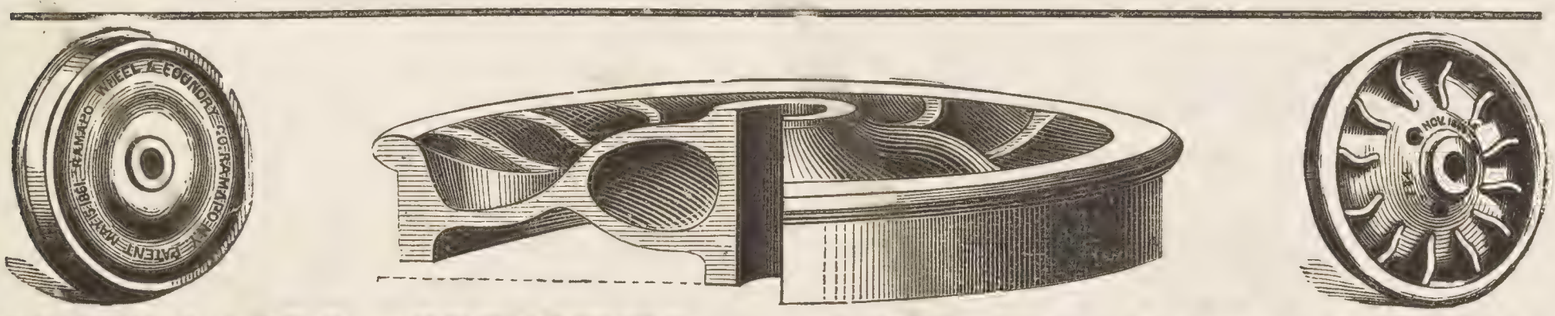

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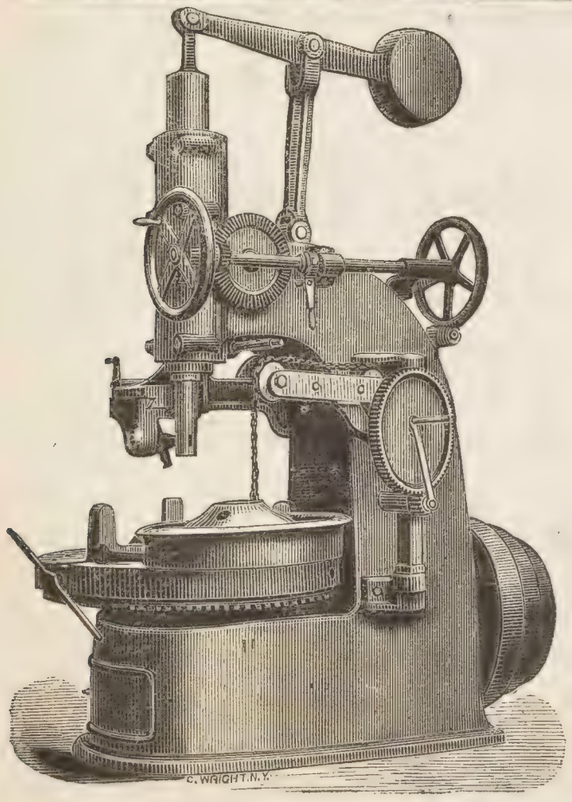

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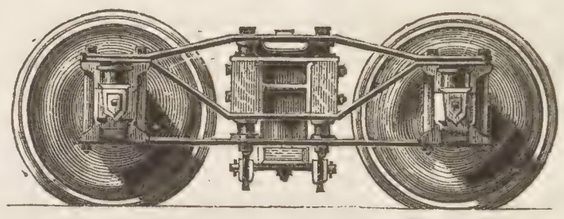
Swing-Beam Truck,

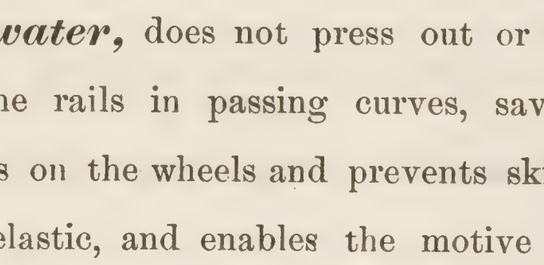
OR SO-CALLED "CALIFORNIA TRUCK."



This is a ***Centre-Bearing Swing-Beam Truck,*** and it is reported by the runners and engineers of motive power that the efficiency of such power is increased by the use of this truck from

Twenty to Twenty-five per Cent.

It takes the curve like a boat in the water, does not press out or endanger the rails in passing curves, saves the flanges on the wheels and prevents skidding. It is elastic, and enables the motive power to start with greater ease and with a greater number of cars, the vibration overcoming the inertia or rest upon the track. The leading features of the patent are the mechanical means employed by which the result is obtained. For the mechanical combination, the reader is referred to the patent issued April 24, 1866.



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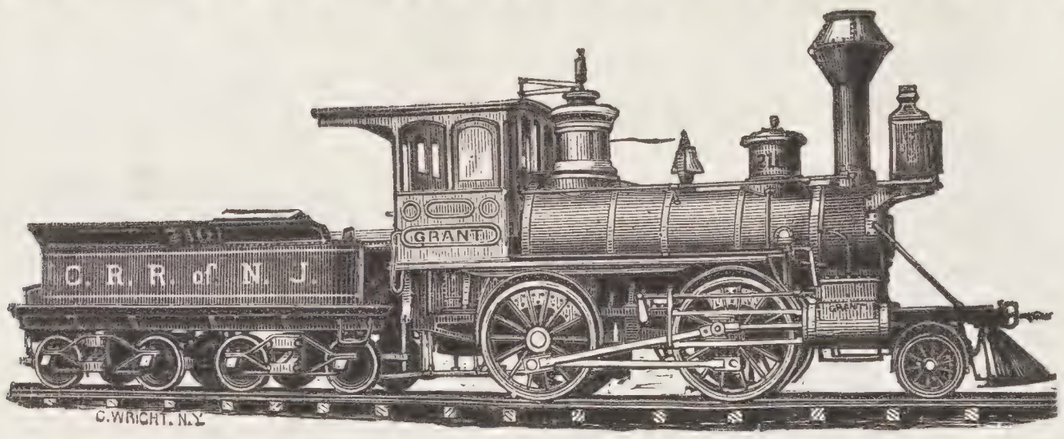

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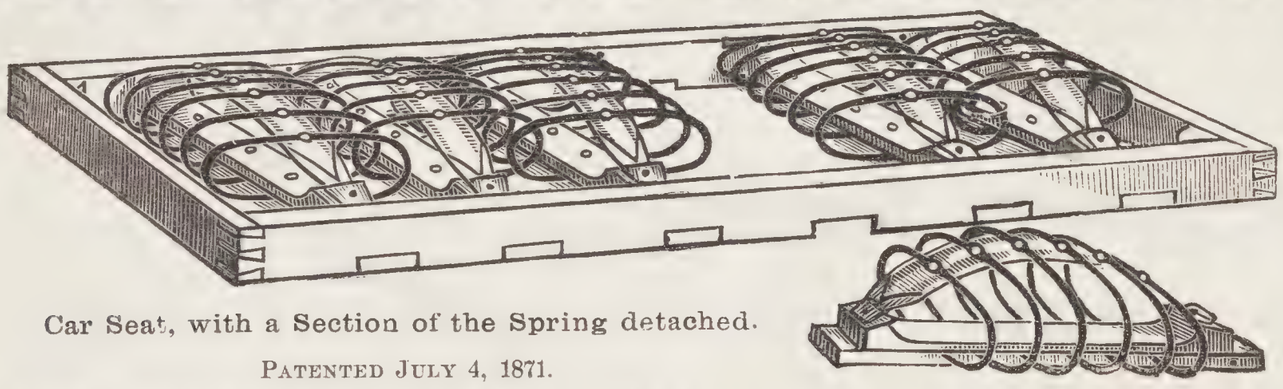

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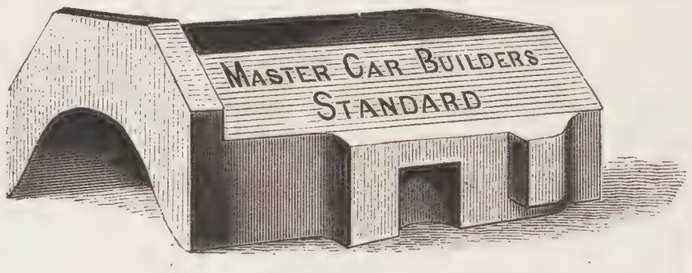

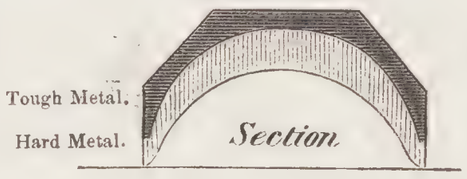

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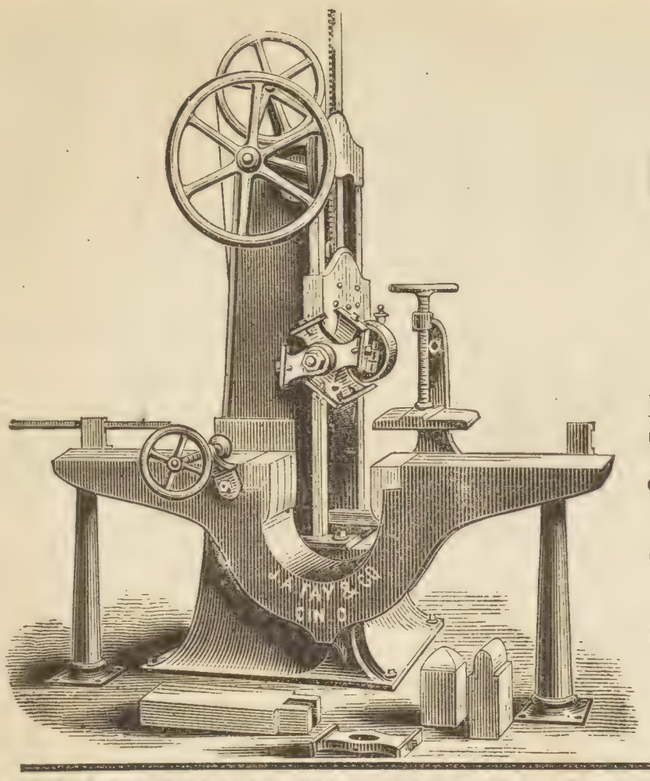

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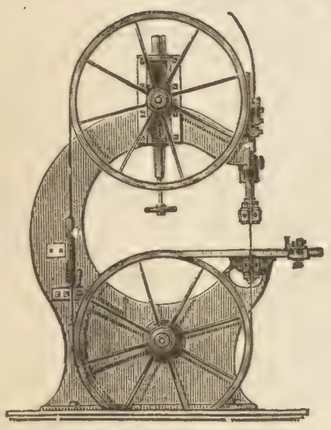

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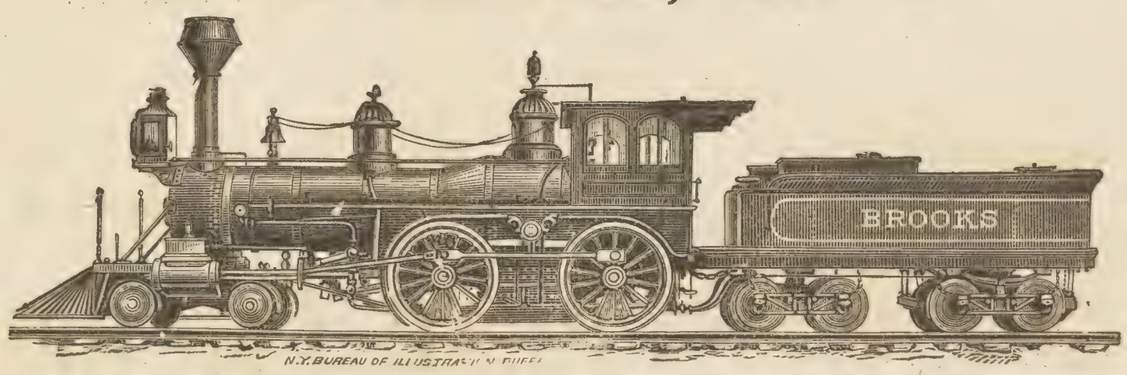

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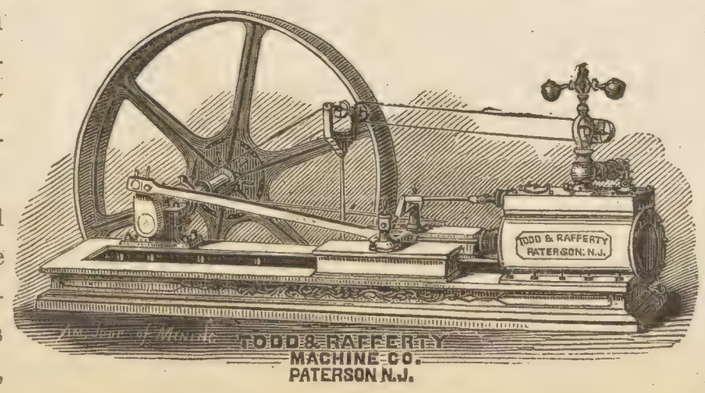

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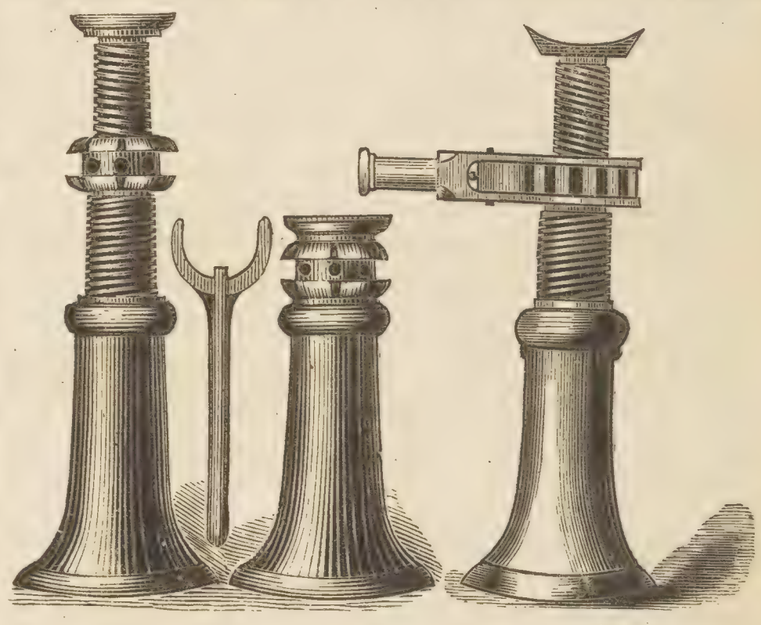

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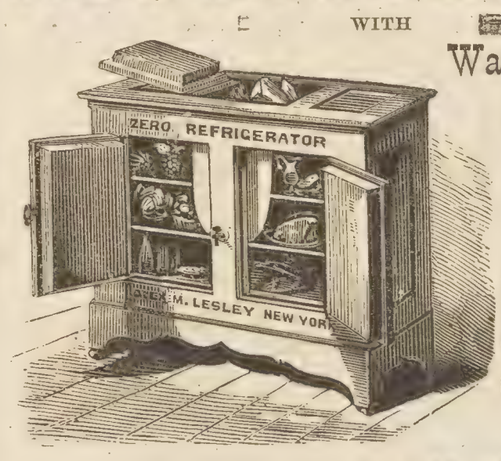

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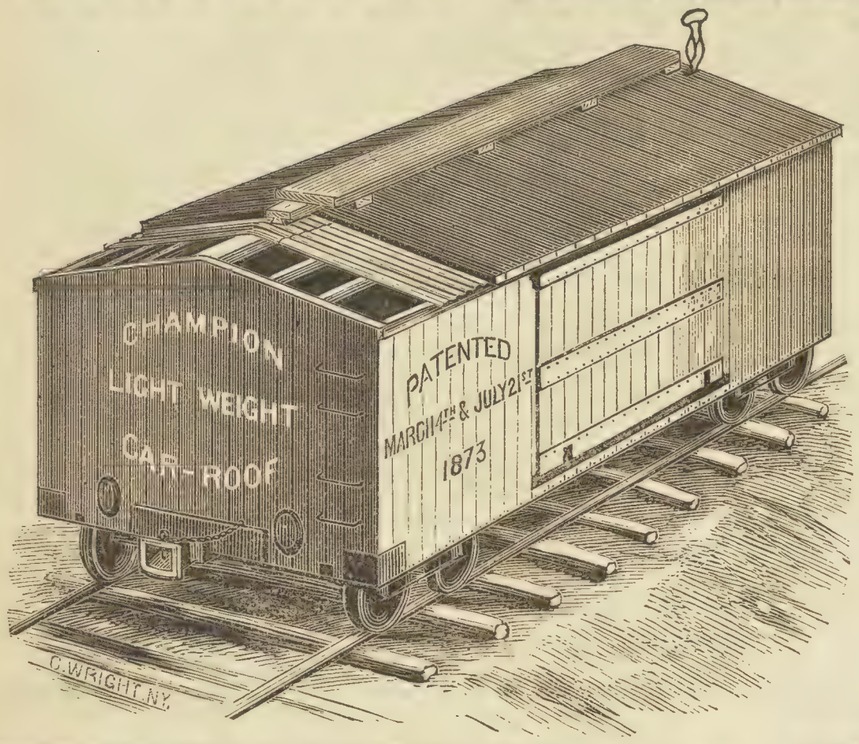

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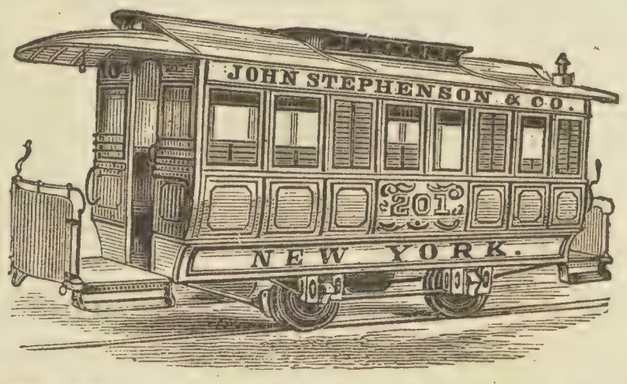

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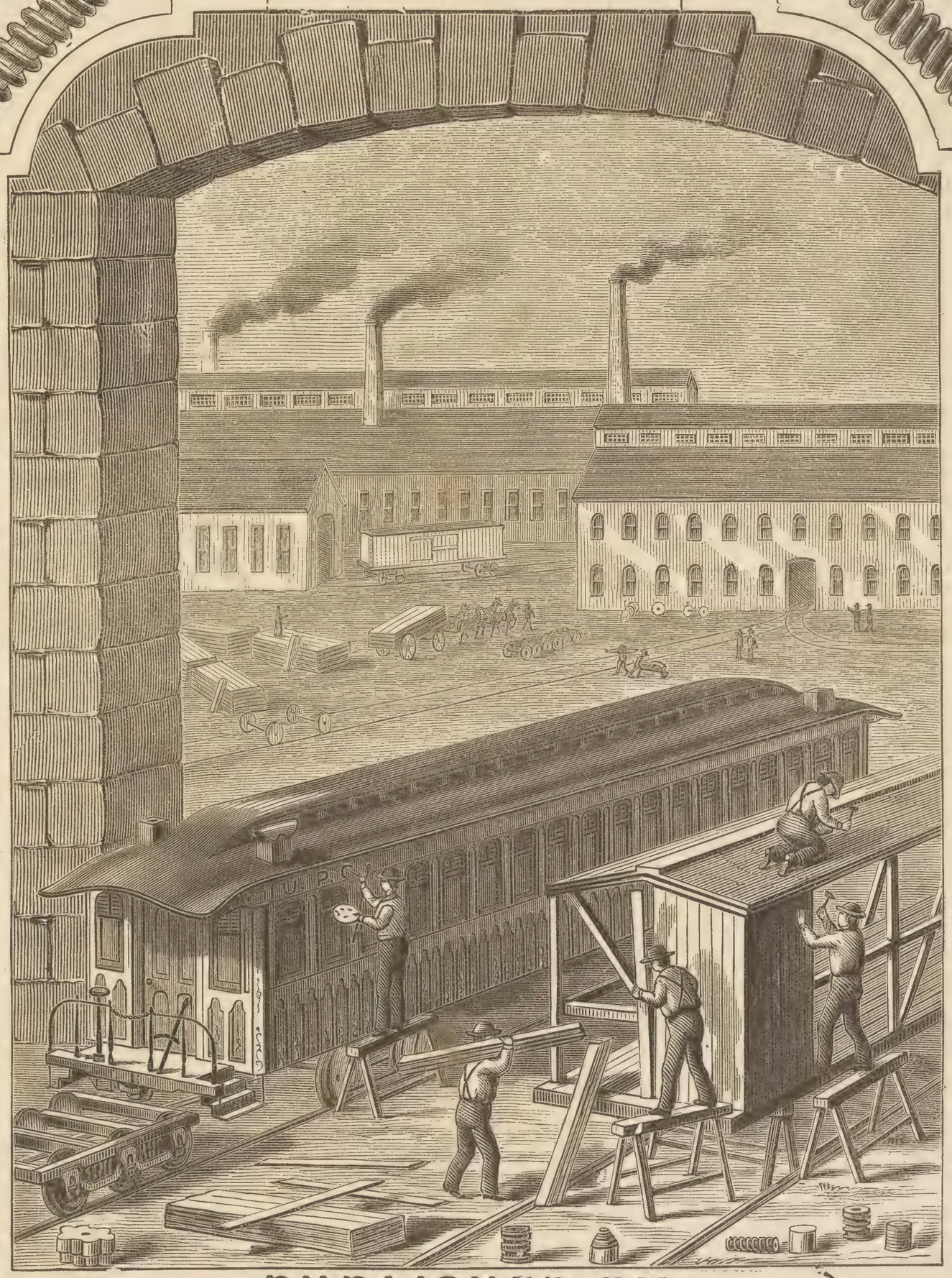

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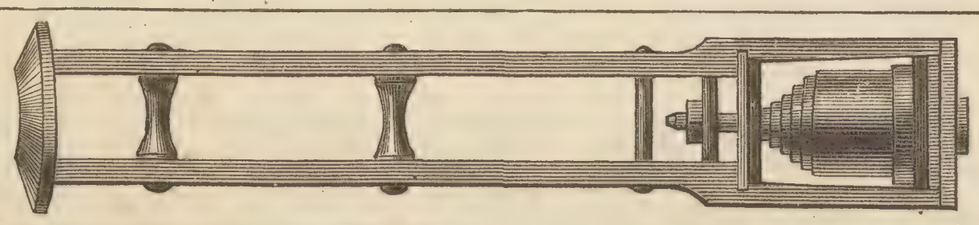

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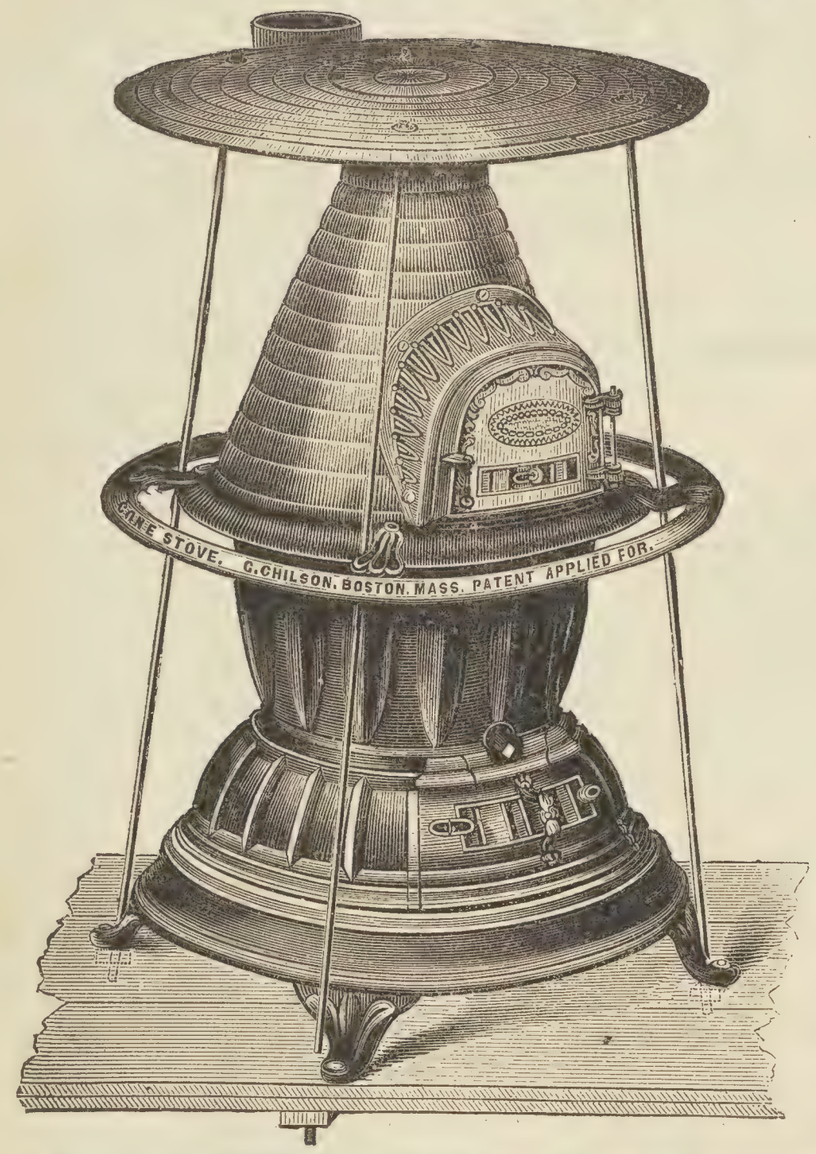
Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

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GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

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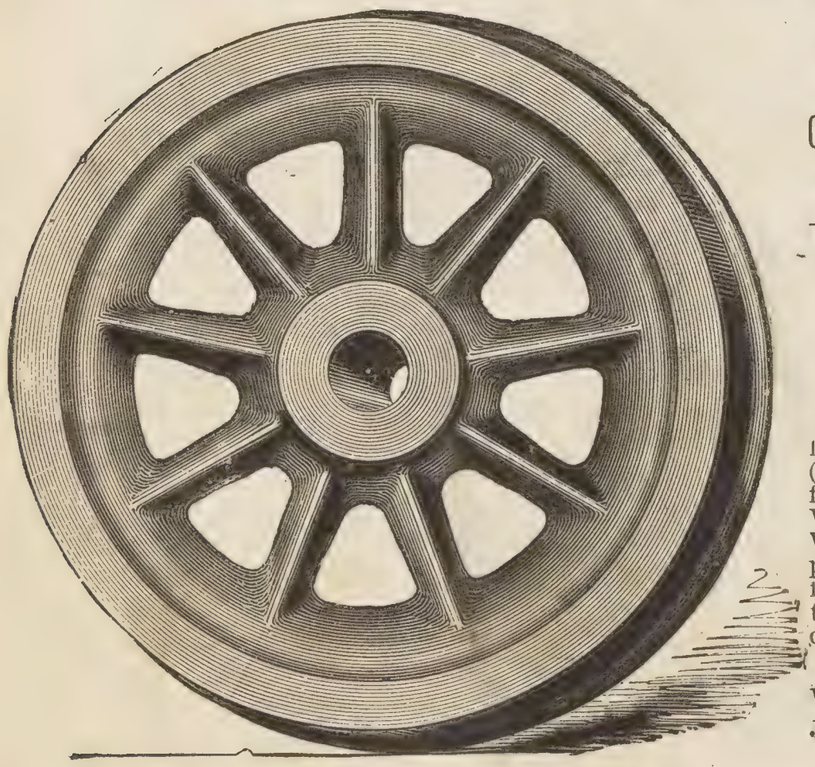

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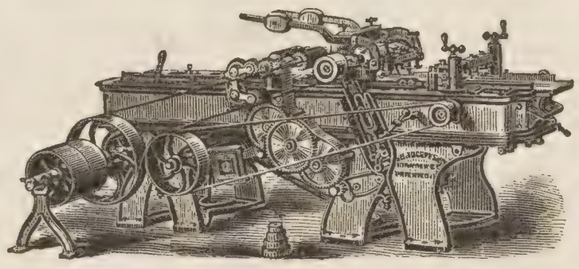

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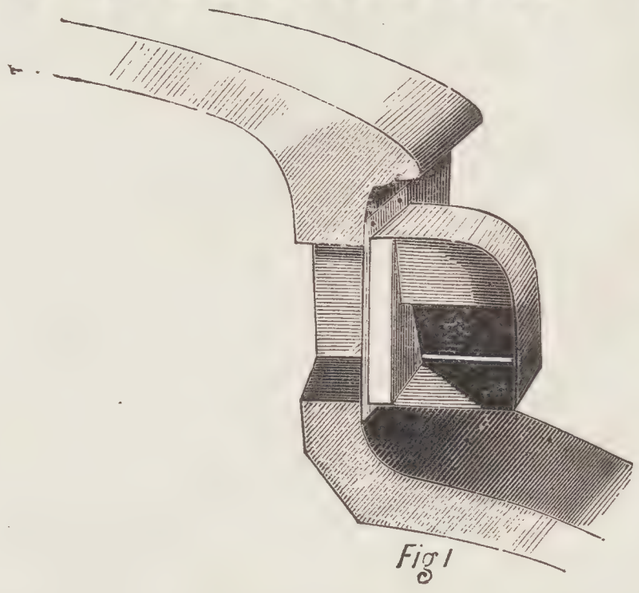
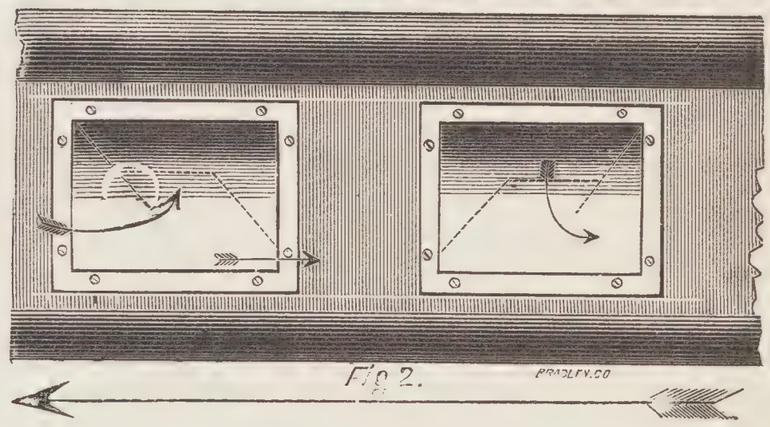


Fig 1



THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is a ways in readiness, and runs itself independent of all employees.

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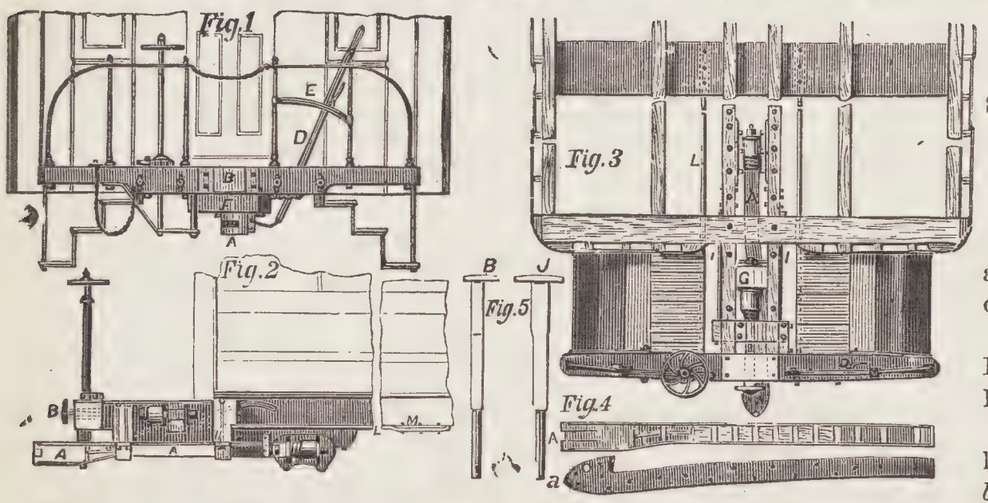

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Send for Illustrated Pamphlet, and call and see working models. **E. MILLER, Patentee.**

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied: and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

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Are now ready to receive orders for all kinds of

FREIGHT CARS.

These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.

T. L. H. YOUNG, President. JOHN W. FLEMING, Superintendent.

HUNTOON GOVERNOR,
FOR
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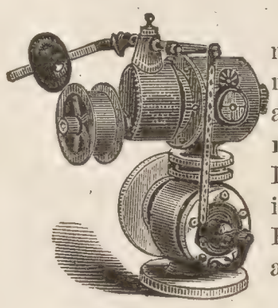
OVER FOUR THOUSAND NOW IN USE.



All Governors fully Warranted, and returnable in all cases where a trial does not prove its superiority over all others, as the **most Perfect, Reliable** and **Economical Steam Governor ever Invented.** It resembles, neither in principle nor in operation, any other Governor known. For Circulars of reference, or information, address

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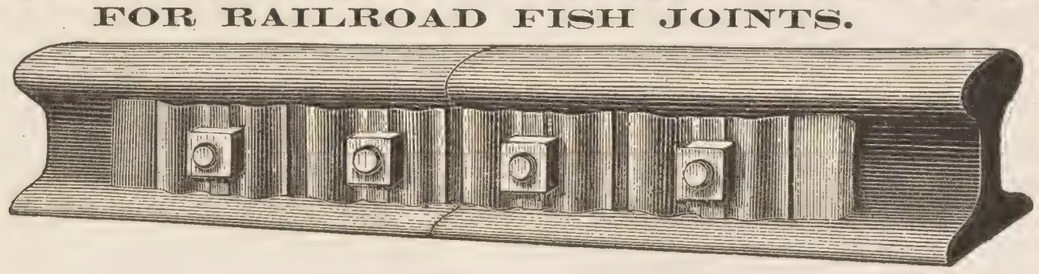
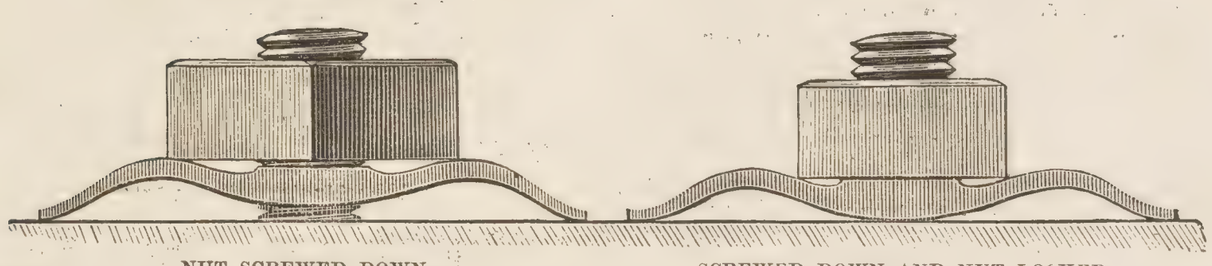
MILLER'S PATENT ELASTIC WASHER AND NUT LOCK,
FOR RAILROAD FISH JOINTS.





NUT SCREWED DOWN. SCREWED DOWN AND NUT LOCKED.

These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

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EDWARD SMITH.
JOHN A. ELMENDORF.

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A GENTLEMAN of 20 years' experience as a "Car Builder," wants a position as Master Car-Builder on some Railroad. Can furnish best of references. Address

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NOYES' PATENT LIQUID PACKING.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.

The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident the eto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

FOR RAILROADS, AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Packing certain quantities of mineral oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather, an element that is lacking in mineral oil. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and mineral oil together. In cold weather, the combination is not so essential, but it will always be found economical to combine a small quantity of the Liquid with the mineral oil which is generally used upon railroads.

Where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes, and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used. We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

BOSTON, LOWELL AND NASHUA R. R. SUPERINTENDENT'S OFFICE,
P. NOYES, AGENT, BOSTON, April 13. 1874.

Dear Sir: We have been using your LIQUID PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq.,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent thickening; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Belt and Leather Stuffing Co., CHICAGO, Dec. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C. B. & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING same as purchased of you before, and send as soon as possible.
H. I. HIGGINS, *Purchasing Agent Quincy Railroad.*

CHICAGO, ILL., May 7, 1874.

AGENT BELT AND LEATHER STUFFING CO.:
Dear Sir: You will please forward to the C. B. and Q. R.R. ten barrels Liquid Packing.
H. I. HIGGINS, *Purchasing Agent C. B. and Q. R.R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.
J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq.: ALBANY, Nov. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report;

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.
JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

Send for a Barrel. No charge unless it does all we state.

Manufactured by the Belt and Leather Stuffing Co.,
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Sold by Vose, Dinsmore & Co., New-York.

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Warranted Fire and Water Proof.

Will cover more surface and outwear any paint manufactured.

Owing to its extreme fineness, every particle is utilized. No sediment settles to the bottom, and when applied, it produces a smooth, glossy surface. With less oil to the pound, this paint will go over twice the space of other so-called "Mineral" paint, and produces a more intense color. It is entirely free from dirt, slate, or any impurities, being manufactured out of the best Red Hematite Iron Ore, and pulverized finer than any paint that has heretofore been manufactured by a process peculiar to this Company.

This paint is not affected by water or extremes of cold and heat, and is peculiarly adapted for tin roofs. It will also stand hard usage, and for railroad cars or wagons can not be excelled. It has been used by the Union Pacific Railroad Company, and by whom it is pronounced superior to any quality they have ever used.

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Rawlins' Metallic Paint Company,

RAWLINS, WYOMING.

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EITHER OF IRON OR WOOD.

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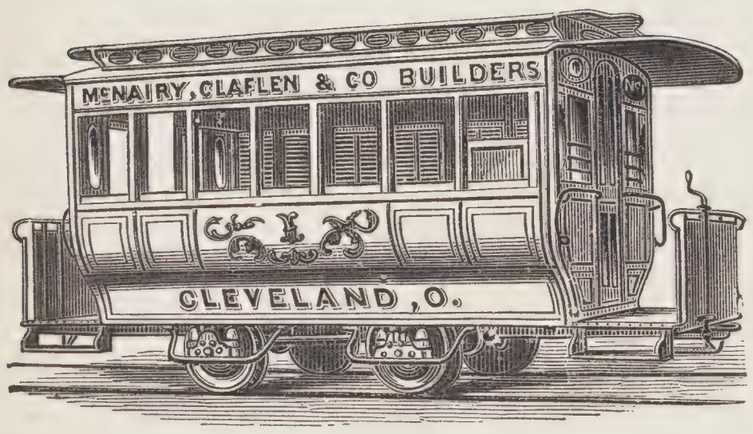

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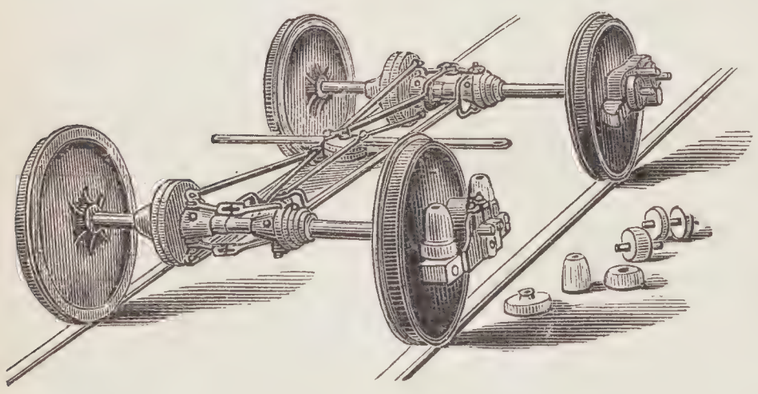

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Address IRON CLAD PAINT COMPANY,

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This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

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The K. P. R. R. CO.	L C. & L. R. R
T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
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Gen'l Purchasing Agent L. S. & M. S. R. R.

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These works, recently completed, are furnished with the very latest and best Machinery, and are prepared to furnish the better qualities of work with promptness.

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Communications by letter will receive prompt attention.

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WITHOUT BELTS OR BELLOWS.

It is more **Easily Worked,** gives a **Better Blast,** and is the **Cheapest** forge made, and

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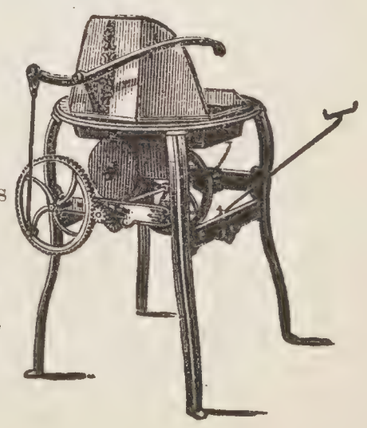
Also, Curry Combs, Boring Machines, and Cooley's Whip Racks, etc., etc.



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BRUSHES OF EVERY DESCRIPTION

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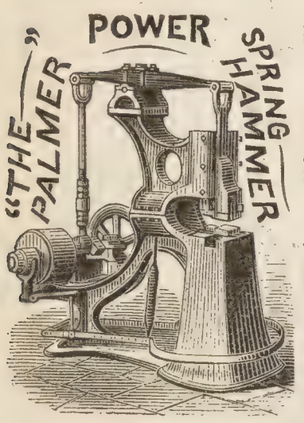

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Simple, Powerful,

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Four Sizes now being Built.

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Who are also Builders of the

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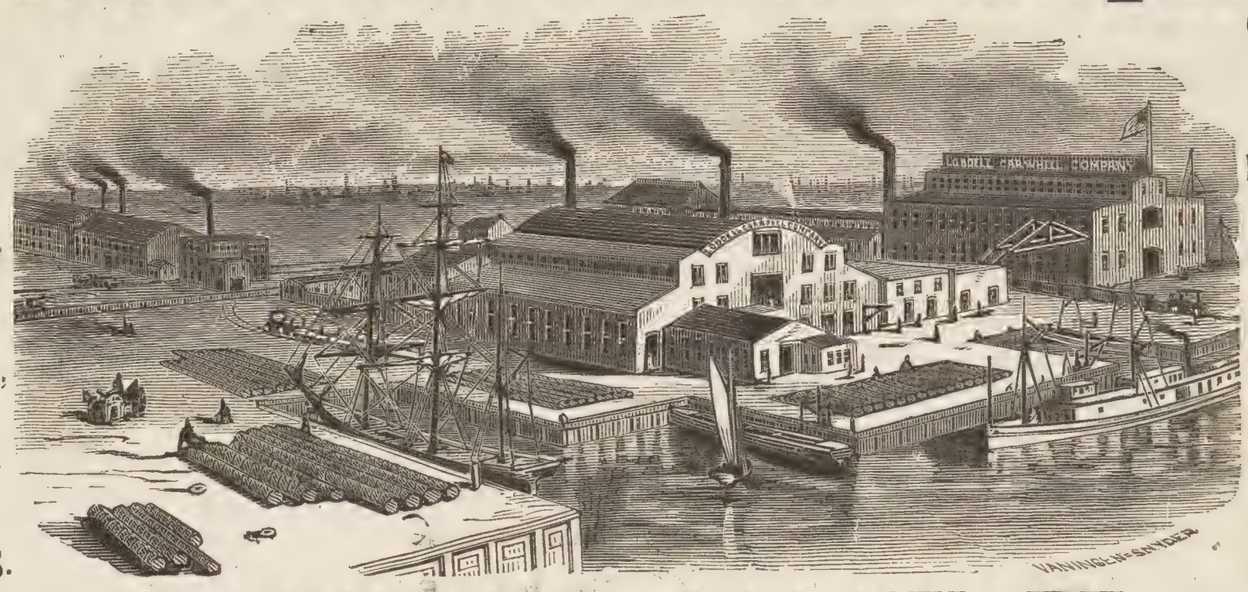
SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



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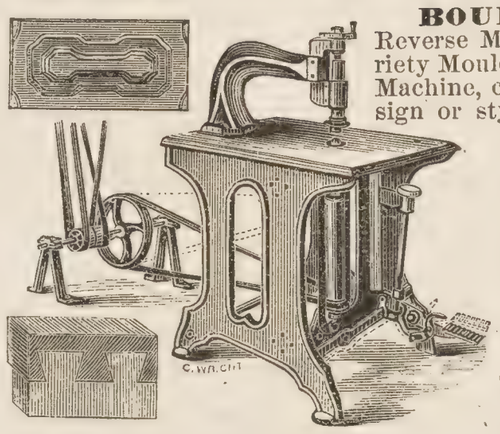

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Routes and grooves for Windows, Stairs, Cars, Bridges, etc., etc.

Moulds, fine Bracket and general Scroll Work. It is a first-class Shaper and Moulder, Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.

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A GENTLEMAN, who has occupied the position of "*Master Car-Builder*" for ten years, is open for a similar position, or would keep a set of books. Address, L. F. DINSMORE, Box 4055, New-York

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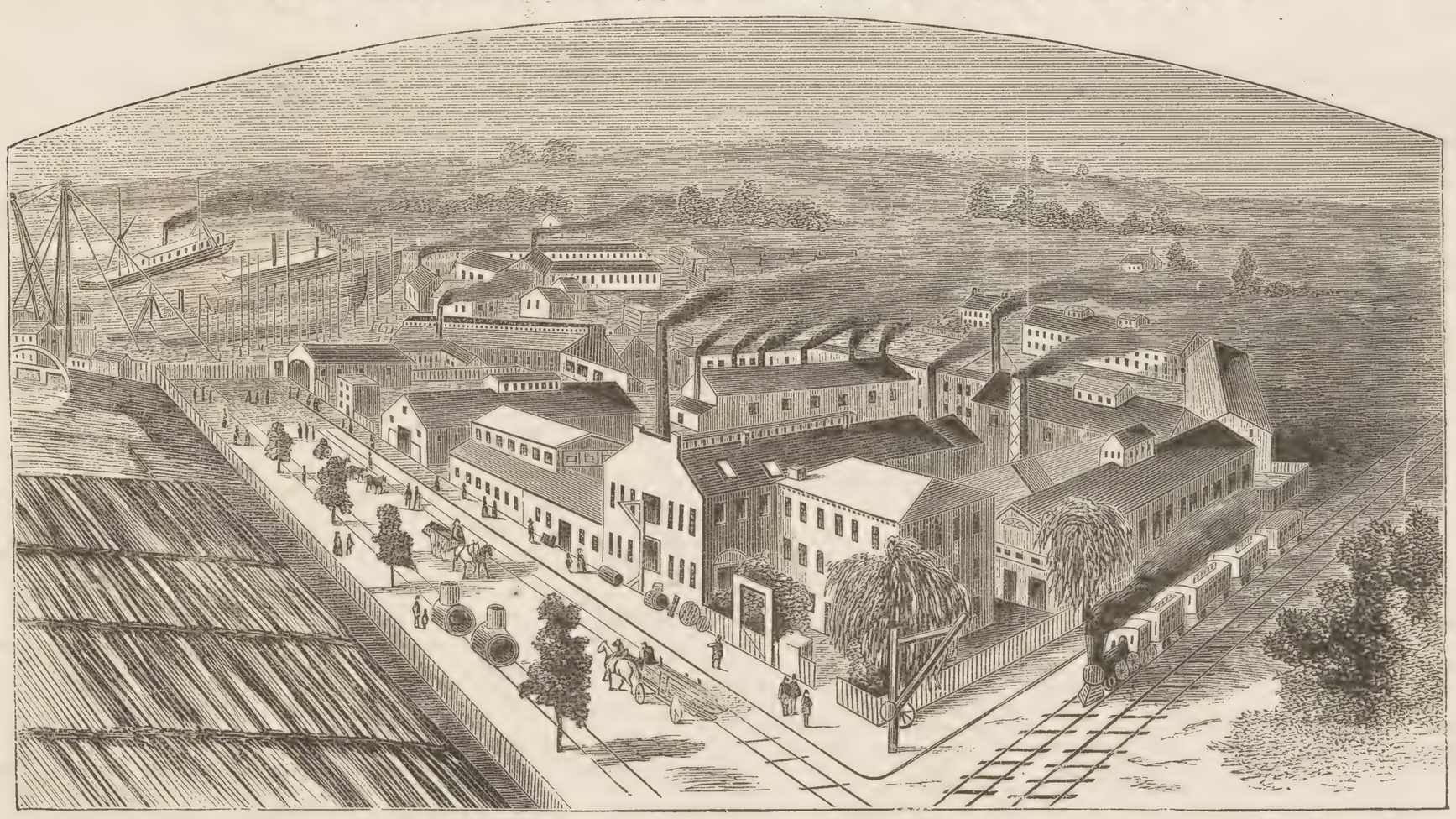

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MURPHY & CO.,

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SPECIAL ATTENTION PAID TO

RAILWAY REQUIREMENTS.

Outside Finishing,	$5.50	Engine,	$5.00
Outside Rubbing,	4.50	Coach-makers' Japan,	2.00
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These goods are now in use on the principal Railways of the country, and have had a success never before reached by any others. For Railway uses they are **Superior** to the imported.

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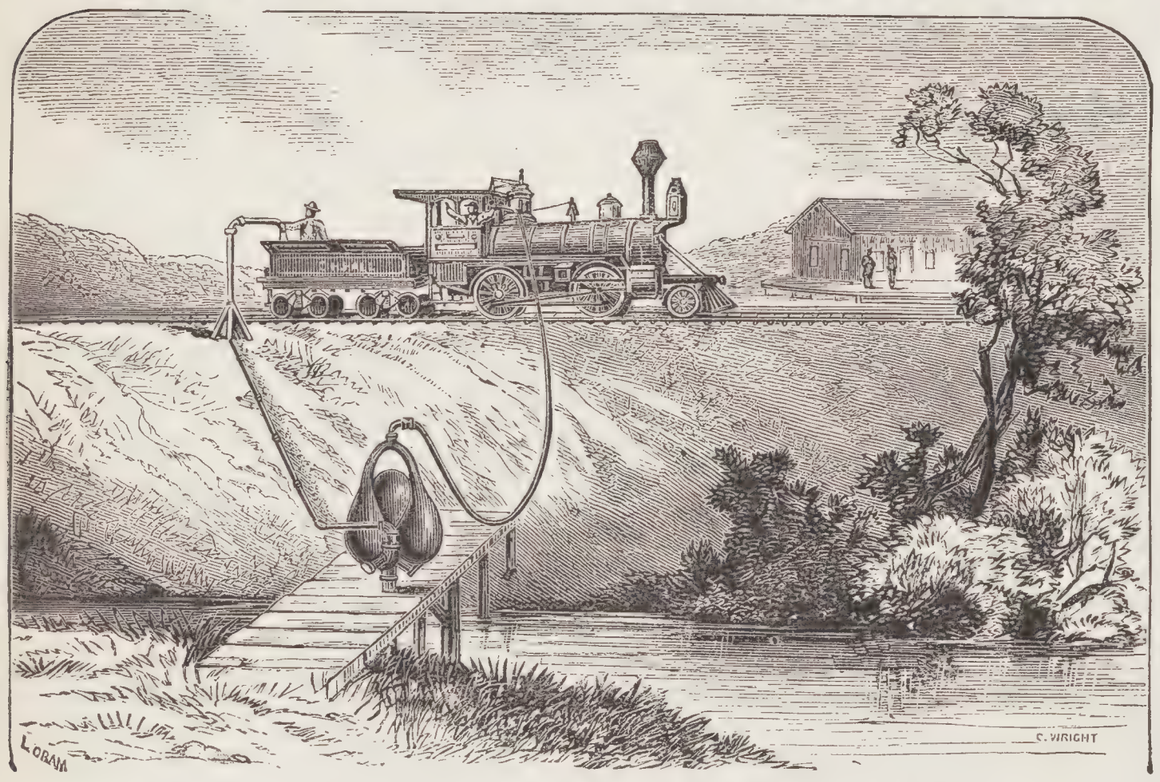

APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

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Slide-Valve and Automatic Cut-off

ENGINES,

From 2 to 300 H. P.

ALSO,

BOILERS OF ALL KINDS,

Ames' Portable Engines,

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First-Class Work at LOW PRICES.

THE

Atlantic White Lead

AND

LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

TRADE-MARK.

Robert Colgate & Co.,

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INDIANA CAR COMPANY,

MANUFACTURERS OF

FREIGHT CARS,

(Capacity, Six Cars per day,)

JOHN McMILLAN, Manager. Cambridge City, Ind.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. V.
No. 7.

JULY, 1874.

One Dollar per Annum.
Single Copies, 10 Cents.

REPORT

OF THE

PROCEEDINGS OF THE EIGHTH ANNUAL CONVENTION OF THE MASTER CAR-BUILDERS' ASSOCIATION.

THE delegates to the Eighth Annual Convention of the Master Car-Builders' Association assembled on the 10th of June, 1874, at College Hall, in the city of Cincinnati. The President of the Association, Mr. I. W. Van Houten, of the Pennsylvania Railroad, not being present, the Convention was called to order, at 10 o'clock A.M., by the Vice-President, Mr. V. D. Perry, of the Hartford, Providence, and Fishkill Railroad.

The Chairman, Mr. Perry, then introduced George W. C. Johnston, Mayor of the city of Cincinnati, who addressed the Convention as follows:

ADDRESS OF THE MAYOR OF CINCINNATI.

Gentlemen of the Master Car-Builders' Association:

I bid you a most cordial welcome to Cincinnati. We feel honored that you have chosen our city for the place of your annual assemblage, composed of delegates from every part of our wide-spread republic. There is no industry which is so connected with progress and which savors so much of internal development as that which you represent. It is the most exclusively modern of all the important phases which American industry has assumed. There is nothing like it in the world. We have 70,000 miles of railroad among our 40 millions of people—as much as all Europe has, with its 300 millions inhabitants. In no department of mechanical ingenuity and skill are we so superior to the rest of mankind as in the manufacture of cars. This is attested by all who have ever traveled on the different continents. Our magnificent sleeping-cars were the admiration of those who attended the Vienna Exposition. We are pleased to see and to take by the hand those who are the constructors of such elegant specimens of American mechanism.

The extent of your Association is well evinced by its national organization and its annual assemblages. Among your list of delegates I recognize many distinguished names connected with your branch of railroad improvement that have long been familiar to the reading public. Bespeaking for you the hospitalities of our citizens of every degree and avocation, I conclude, in behalf of our city government, in giving you a hearty greeting, and wishing you a pleasant and agreeable session.

ENTERTAINMENTS.

A communication was received from P. P. Lane, Esq., chairman of the executive committee of merchants and manufacturers of Cincinnati, inviting the members of the Convention to a series of entertainments, as follows: On Wednesday evening, a visit to Robinson's Opera House; on Thursday afternoon, a carriage ride through the suburbs; on Thursday evening, a balcony serenade at the Gibson House; and on Friday, a steamboat excursion on the Ohio River. On motion, the invitations were accepted.

ELECTION OF VICE-PRESIDENT PRO TEM.

THE CHAIRMAN announced that the first business in order was the election of a Vice-President *pro tem.*; whereupon Mr. M. P. Ford, of the Pittsburg, Cincinnati, and St. Louis Railroad, was unanimously chosen.

ADDRESS OF THE CHAIRMAN.

THE CHAIRMAN and acting President of the Association then addressed the Convention as follows:

Gentlemen of the Master Car-Builders' Association:

I am obliged to say to you, with much regret, I assure you, that for reasons unknown to myself our worthy President, Mr. Van Houten, has failed to appear before you this morning. Under these circumstances, you will readily see that I am placed in the position which compels me to act as your presiding officer very unexpectedly and with scarcely any notice. Perhaps if I had ample time to prepare myself, I should not prove a success as a presiding officer; but, be that as it may, I shall endeavor, with your assistance and forbearance, to do what all of us are expected to do, and that is, never to shrink from the performance of any duty imposed upon us, no matter how arduous it may be.

It is not necessary for me to mention the great importance of these our annual gatherings. Our main object is to improve our capacities and knowledge as to whatever relates to our vocation, and in my opinion this can only be accomplished by a free discussion of the various subjects which are from time to time presented to your Association and requiring your investigation. There are many important questions to be brought before you during our present session, and in the discussion of them, should I err in my rulings, I beg to assure you it will be a mistake of the head and not of the heart.

THE ROLL OF MEMBERS.

The Secretary then called the roll of members, when the following gentlemen answered to their names:

F. D. Adams,	Boston and Albany R.R.
C. A. Smith,	Late of Erie Railway.
A. Steinbach,	Philadelphia and Reading R.R.
H. O. Wadlie,	Illinois Central R.R.
H. Longest,	Baltimore and Ohio R.R.
R. B. More,	Indianapolis and St. Louis R.R.
W. J. Worth,	Phila., Wilmington, and Baltimore R.R.
Robert Gunning,	Allegheny Valley R.R.
F. Childs,	Great Western of Canada R.R.
G. W. Demarest,	Northern Central R.R.
Samuel Griffith,	Indianapolis, Cin., and Lafayette R.R.
Enos Varney,	Fitchburg R.R.
V. D. Perry,	Hartford, Providence, and Fishkill R.R.
Leander Garey,	New-York Central and Hudson River R.R.
W. R. Davenport,	Erie Car-Works.
R. S. Ramsey,	Pennsylvania R.R.
M. P. Ford,	Pittsburg, Cin., and St. Louis R.R.
D. S. Dockstader,	Atlantic and Great Western R.R.
John Lightner,	Boston and Providence R.R.
M. C. Andrews,	Late of New-York and New-Haven R.R.
M. W. Dickerman.	Manchester and Lawrence R.R.
J. D. McIlwain,	Lake Shore and Tuscarawas Valley R.R.
A. J. Allen,	Indianap., Bloomington, and Western R.R.
M. Sessions,	Late of Taunton Car Co.
D. Sutherland,	Detroit Car-Works.
Ambrose Ward,	Pennsylvania R.R.
Sam. W. Myers,	Pennsylvania R.R.
W. F. Smith,	Cleveland, Columbus, and Cincinnati R.R.
John McVay,	Pittsburg, Cin., and St. Louis R.R.
C. Woods,	Union Line and Transportation Co.
A. Langmaid,	Northern New-Hampshire R.R.
J. L. Hackathorn,	Kentucky Central R.R.
E. Lockwood,	Pennsylvania R.R.
W. H. H. Allison,	Cin., Hamilton, and Dayton R.R.
W. B. Snow,	Illinois Central Car-Works.
H. Kirmse,	St. Louis, Vandalia, and Terre Haute R.R.
R. D. Cole,	Atlanta and West Point R.R.
W. H. Trainham,	Richmond, Fred'g, and Potomac R.R.
Willis Davis,	Empire Transportation Co.
S. S. Pilson,	Atlantic and Great Western R.R.
J. H. F. Wiers,	Atlantic and Great Western R.R.
Geo. W. Bitner,	Pittsburg Car Works.
George Rowe,	New-York Central and Hudson River R.R.
J. W. Holmes,	Atlantic and Great Western R.R.
John Kirby,	Lake Shore and Michigan Southern R.R.
E. Martin,	Atlantic and Pacific R.R.
Geo. Hibbard,	Ohio and Mississippi R.R.
C. C. Williams,	West Jersey R.R.
Preserved Smith,	Barney and Smith Mfg. Co.
L. J. Hartman,	Late St. Louis and South-Eastern R.R.
J. M. Leech,	Pittsburg and Connellsville R.R.
Israel Lee,	Pittsburg, Ft. Wayne, and Chicago R.R.
W. W. Wilcox,	Chicago, Burlington, and Quincy R.R.
J. B. Vaughn,	Richmond, Danville, and Piedmont R.R.
S. V. Smith,	Atlantic and Great Western R.R.
John Higgins,	Jeffersonville, Madison and Indianapolis R.R.
R. Attridge,	Cleveland, Columbus, Cin., and Ind. R.R.
David H. Shields,	Indiana Car Co.
T. L. Seevers,	Central of Iowa.
J. Gill Blain,	Gill Car-Works.

HEATING, LIGHTING, AND VENTILATION OF PASSENGER-CARS.

The Secretary presented and read the report of the Committee on the Heating, Lighting, and Ventilation of Passenger-Cars. The report is very voluminous, and considerable time was occupied in the reading. That portion of it which gives in detail the replies to the questions contained in the circulars issued by the committee, was ordered to be tabulated and condensed before being inserted in the official report of the proceedings.

The report, after quoting largely from scientific authorities in regard to the nature of atmospheric impurities and their effects on the human organism, concludes as follows:

"But supposing that the smaller amount of 2000 cubic feet per hour, or 33 feet per minute, for each passenger, be considered sufficient, then there must be admitted for 72 passengers about 2400 cubic feet per minute. Can this be accomplished? and, if so, how? When the difficulties, not only of ventilating, but of warming so large a quantity of air, are considered, many will be ready to say that effective ventilation for railway cars is quite impracticable, and that in the future, as in the past, the traveling public must yield to the force of necessity, and be content with what they have.

"But is it quite safe to arrive at such a conclusion? Taking into account what has been done in the way of improvement during the last ten years in adding to the comforts of travel in other respects, let it not be asserted too confidently that the future is not to witness this also practically accomplished.

"About fifteen years ago, ventilating cars for air seems not to have been thought of—at least, not acted upon. When a car became 'close, in consequence of being overheated,' top vents were opened 'to let out the heat.' If men reasoned at all on the causes of languor, drowsiness, or headache, in a full car, it was probably attributed to the heat. Accordingly, caps were inserted in the tops of old-fashioned flat-roofed cars, affording an opening upward, and afterwards dampers were placed in the caps, so as to be regulated from the inside. Next came the Howard Clam-shell Ventilator, placed on the letter-belt or frieze of a car immediately above the windows. Creamer also introduced what he claimed to be his self-regulating ventilator, placed in the same position. About this time the dome or monitor deck was proposed by Mr. Wagner, and has since been generally adopted. The same devices, and many others which might be mentioned, were applied to the sides of the dome, affording a partial relief.

"Most of these were adopted, however, with reference to taking something out of the car rather than putting something in. By them, some fresh air was admitted, to be sure. Especially was this the case when as many as forty or fifty Creamer ventilators, costing four or five hundred dollars, were applied to a single car. There was also Crowell's bell-top ventilator, designed also as an exhaust. The distinguishing effect of all these devices placed in the top of a car to aid in exhausting the impure air, while no provision was made for a fresh supply, is to rarefy or attenuate the amount of oxygen left in the car, and thus practically counteract the benefit they are designed to accomplish. Impurities can not be skimmed from the top of a car as from a kettle of boiling water; besides, heat is not so inexpensive a luxury, during a large part of the year, that it should be uselessly wasted. Heated currents may be and often are made effective for ventilating

buildings; but it always requires, when successful, other vents for the admission of air, at least equal to those through which the air escapes. So far as we know, no systematic plan dependent on heated currents for putting the air in motion has been applied to cars, unless we refer to Allen's system of bottom ventilation, described in the replies of Mr. Danfield, of the Philadelphia and Baltimore Central Railroad.

"This plan seems to work very well for a portion of the year, but since all the heat on which the ventilating currents depend is intended to be conducted into the the car, whenever this extra heat is not needed, ventilation is gone. If we are to depend, after all, so largely on open doors and windows, often impracticable on account of dirt and drafts, then this plan must be considered good only so far as it meets a part of the conditions.

"If we are to offer passengers only the choice of evils—want of ventilation on the one hand, and drafts and cinders on the other—we shall find much disagreement, but a majority will risk the dangers of the former, of which the senses do not furnish a full warning, rather than endure the latter, to which the senses yield a ready response.

"There remains to be considered that class of ventilators, mostly of a recent date, which provide for sweeping the car with fresh air, and depend for their effectiveness upon the motion of the cars.

"The Harlem and some other roads provide an opening in the end of the dome, through which the air enters as the train moves. The Boston and Albany and some other roads have provided adjustable openings under a hood, at the end of a car, which, when open, allow air to enter, and the exhaust is through ordinary swing-sashes in the dome or other openings.

"An important objection to this class of ventilators lies in the want of distribution of the incoming currents. If air enough is to be admitted to effectively ventilate the whole car, those passengers who happen to sit in near proximity to the opening are likely to get more air than is compatible with the preservation of health, especially in cold weather.

"Judge Maine proposes admitting the air at the bottom of each window, and leaving the control of quantity admitted to the occupants of each seat. This may be a slight improvement on the plan of raising each window slightly, although to us the principle seems about the same. We should question the practicability of keeping out the fine dirt in this way, in dusty weather, and still more the practicability of heating the cold air along the floor, where the heat is most needed.

"If the conclusions of the scientists are of any value, and provision must be made for admitting some two or three thousand cubic feet of air per minute in order to preserve a full car in a salubrious condition, then there must either be many small openings, or some plan must be adopted for distributing the air before it impinges upon the passengers. Nearly all the plans in use that secure any thing like effective ventilation are open to objection on account of drafts. The speed with which it is safe to allow air to come into contact with the person depends, of course, upon the temperature; but five feet per second, or a moderate breeze moving something less than four miles per hour, is the limit of speed usually allowed to ventilating currents at the point of contact. Hence, if 2400 cubic feet are to be admitted, and move through the car, per minute, at a speed not to exceed five feet per second, there must be entrance openings and exits equal to eight square feet, or else there must be some means for distributing this amount of air after it enters the car, and before it reaches the passengers.

"The Ruttan system referred to, with the replies of Mr. John Kirby, of the Lake Shore and Michigan Southern road, may be entitled to some consideration in this regard, but the attention it requires on account of impurities collected within the car, and perhaps other causes, have prevented its general use.

"A plan recently introduced by Messrs. Sanborn & Gates, and described in the replies from those gentlemen, probably involves a more comprehensive reach of the subject than any other, and is worthy of the attention of railroad men. It provides for first filtering or straining the air through very fine screens before it enters the car, and then distributing a full supply in the dome till it is gradually and gently forced downward, and so out at the bottom of the car.

"Air can undoubtedly be moved downward as easily as upward, and the great advantage of downward currents is to secure a better diffusion, and when artificial heat becomes necessary, it has a tendency to keep the heat down in the bottom of the car. This plan also affords advantages for heating or cooling the supply of air admitted, if desired, and is adapted for all seasons of the year. It is perhaps too soon to attempt to say what objections may be brought against this system, but that effective ventilation for cars may be secured in this way is undoubted, and if no objection is found to the mechanical appliances, we see no reason for criticising it. Your committee are fully convinced that heating and ventilating apparatus should be made to coöperate together, when both are required; but since the latter alone is always necessary, they should be capable of easy separation, or be adjusted so that the one may modify the other.

"We believe that the requirements of the case will be most fully met by some plan for heating by which the heat is distributed in radiating pipes along the floor, or under the seats, through the entire car, cooperating with the requisite quantity of fresh air distributed in the top of a car, and forced downward in gentle currents.

"On the question of lighting cars, we have no new suggestions to offer. Experiments with mineral sperm oil, such as throwing up and breaking lighted lamps, which were invariably extinguished, have served to confirm us in the belief that our recommendations of last year were well founded.

"W. E. CHAMBERLAIN,
"A. GLEASON, } *Committee.*"

Discussion on the report was on motion postponed until 10 o'clock to-morrow morning.

PROPRIETY OF FORMING BENEFICIAL SOCIETY.

The committee on this subject submitted the following report, which was read by the Secretary:

To the Master Car-Builders' Association:

The undersigned committee appointed to consider the propriety of forming a Beneficial Society among the members of the Association, would respectfully report that, in their opinion, such a society would be proper and desirable; the society to be composed of such members of the Master Car-Builders' Association as may be willing to subscribe their names to an article of agreement to pay such sum of money as may be agreed upon at the death of any member,—such sum of money to be paid to his widow, or heirs, or his legal representative. Your committee would recommend that a committee of three be appointed to draft a form of agreement to be submited to the Association for its approval.

G. W. DEMAREST,
W. R. DAVENPORT, } *Committee.*

MR. F. D. ADAMS, Boston and Albany R.R., suggested that before such a committee was appointed, the Convention ought to determine upon the propriety of forming such a society. In view of the fact that societies of this kind were becoming very numerous all over the country, it was a question with him whether this matter was not likely to be carried to excess. There were numerous life insurance companies of all sorts, which were as available for railroad employees as for any one else. He was not opposed to the principle upon which mutual benefit societies were founded; the employees of the Boston and Albany road had formed one with a numerous membership; but it was very expensive, and he thought the same advantages might be obtained through the regular life insurance organizations, with less cost. For his part, he would rather pay on the death of a member of the Association, whatever the circumstances of the case might require, by a special assessment, than to organize a society.

MR. F. CHILDS, Great Western of Canada, favored the recommendation of the committee, and the formation of such a society. He did not think an assessment for special cases was a very effective means of relief. The money could not so readily be got at when it was wanted. It was very different from having a fund already in hand which widows and orphans could claim and lay their hands upon as a right. Such a society would not be very expensive. There had thus far been very few deaths in the Association.

After some further discussion, the question was taken on agreeing to the recommendation to appoint a committee of three to prepare a plan for such a society, and it was lost.

AN ASSOCIATE MEMBER ADMITTED.

MR. F. D. ADAMS, Boston and Albany, proposed the admission of Mr. William E. Partridge, of New-York, as an associate member of the Association, recommending him as a gentleman who had taken a great interest in the objects and purposes of the Association, and who, from his mechanical knowledge and the important service he had already rendered in the preparation of the Dictionary of Terms, would prove to be a valuable member. A ballot was taken, and resulted in the casting of 29 votes for Mr. Partridge, and none against him, and he was thereupon declared duly elected an associate member.

INVITATIONS.

A communication was received from Mr. Jonah Woodruff, the proprietor of the Woodruff sleeping and palace cars, inviting the members of the Convention to visit one of his cars at 4 o'clock, P.M.; also from the President of the Merchants' Exchange of Cincinnati, inviting the members individually to visit the Exchange at any time that might suit their convenience during their stay in the city—which invitations were severally accepted.

SUNDRY COMMITTEES.

The following committees were appointed by the Chair:

On Assessments.—F. D. Adams, R. S. Ramsey, and R. Attridge.

On Place of next Annual Meeting.—H. O. Wadlie, J. W. Holmes, and F. Childs.

On Officers for ensuing Year.—J. L. Hackathorn, Willis Davis, and C. A. Smith.

On Subjects for Discussion at next Annual Meeting.—W. R. Davenport, F. D. Adams, and Ambrose Ward.

The Convention then adjourned to 9 o'clock to-morrow.

SECOND DAY'S PROCEEDINGS.

The Convention met pursuant to adjournment.

THE CHAIR stated that the first business in order was the consideration of the report of the committee on

HEATING, LIGHTING, AND VENTILATION.

MR. L. GAREY, New-York Central and Hudson River, said that the subject of the report was one of the greatest importance, especially that part of it which pertained to the ventilation of passenger-cars. The hot weather now prevailing, and of which we all had a realizing sense, was a forcible reminder of the advantages of pure air. No public conveyances were so poorly ventilated as passenger-cars, and if any improvement upon present devices for remedying the evil could be made, the means for doing it should be ascertained. Every member should contribute from his experience whatever he is able, to accomplish the desired end. He was glad to notice that the subject of ventilation was receiving a due share of attention in our common schools, and that the nature and elements of the atmosphere, its effects on physical health, and the importance of a right understanding of its laws, were getting to be better understood. He hoped there would be a full discussion of the subject in its application to railway cars.

MR. J. D. MCILWAIN, Lake Shore and Tuscarawas Valley, said that as he was perhaps the youngest member of the Association, he felt some reluctance in presenting his views in advance of his older associates. He had had, nevertheless, several years' experience in the construction of cars, although the road he now represented was a new one. So far as his experience enabled him to judge, he thought the best method of car-ventilation was to admit the air at the bottom of the car and let it out at the top; and any plan that would accomplish this, with a due regard to the peculiar conditions incident to a rapidly-moving vehicle, and the varying extremes of temperature at different seasons, would be an important step toward the desired end. He did not find that the system of letting the air in and out at the top of the car exclusively worked well, for the reason that it did not create sufficient movement of the volume of air in the lower part of the car, where it was most needed.

MR. W. W. WILCOX, Chicago, Burlington, and Quincy, was not present when the report of the committee was read, and could not speak with special reference to what was contained in it. His road had formerly used the Ruttan system, but did not find it to be altogether satisfactory. It was very good with respect to buildings, but was not so well adapted to cars unless it received very careful attention—much more than it is apt to receive in ordinary practice. His road was now using the system of taking in the air at the frieze and exhausting in the upper deck. The supply openings in the frieze, or upper part of the car sides, were protected by perforated plates, which to a very great extent excluded the dust. He had tried the plan of taking in air at the bottom, but it did not prove to be a success.

MR. AMBROSE WARD, Pennsylvania R.R., had abandoned the frieze plan on account of the dust. He had found that the best point for admitting the air was under the hood at the end of the car, with an automatic arrangement on the roof for exhausting it.

MR. W. R. DAVENPORT, Erie Car-Works, said that in regard to this matter of car-ventilation, he did not feel that any blame attached to car-builders or railroad men if they had not accomplished all that was desired. It was one of the most perplexing and difficult problems ever presented for solution. A car contained a large number of people in a small space, it moved with rapid or varying rates of speed, in all kinds of weather and extremes of temperature. The public expected all these conditions to be provided for, and all the difficulties which they presented to be overcome at once, which was manifestly an impossibility. Great efforts, however, had been made in this direction, and among these was the Ruttan system. One

important fact which is very apt to be overlooked, is that a kind of ventilation which will do for summer will not do for winter, and *vice versa*. In the one case it was complicated with heating, and the two problems became one. The carbonic acid exhaled from the lungs, and the most necessary to be got rid of, naturally falls to the floor. It will not go out at the top, but must be got out in some other way. If there is too much exhaust at the top it lets out all the warmed air in winter. To get pure air, it must be taken in high up and not low down. Ventilation from windows in winter was not to be thought of. The air must be warmed in some way before it enters the car. This we have got to do. The top of the car must be closed in winter and there must be a free out-flow from the floor. This can be done without much trouble; in fact, the difficulties of winter ventilation are no comparison in their magnitude with those of summer, on account of dust, cinders, and smoke.

Mr. M. P. Ford, Pittsburg, Cincinnati and St. Louis, said that none of us were satisfied with the methods we were using. He believed that cars could be ventilated properly in summer, but to do it involved the employment of apparatus more complicated and expensive than the roads could afford. He thought that, for summer, Foote's plan was as near perfect as any he had seen tried, and which consisted in ridding the inflowing air of dust and other impurities by causing it to pass through a spray of water. This water was carried in a reservoir underneath the car holding about two barrels, and the impurities contained in the air were shown by the color of the water, which was nearly as black as ink after being used for any considerable time. He believed that in winter the air must be exhausted at the bottom. The great obstacle to the working of any effective plan was the movement of the car. This set nearly all theories at defiance.

Mr. John Kirby, Lake Shore and Michigan Southern, said that his road, as long ago as 1854, put the Foote ventilator into 24 new cars. The box-reservoir under the car held between two and three barrels of water, and was 16 or 18 feet long. It was found objectionable, however, for several reasons. The apparatus occupied too much room in the centre of the coach, the spray injured the seats, and in wet weather the car was too moist for comfort. These ventilators were all taken out at the end of the season, and Westlake's plan was next tried. This consists of a hood on the roof facing each way. It worked very well in the open country; but in the woods, where the smoke and cinders follow in the wake of the cars, it was less satisfactory. The Ruttan system was next tried, and was found to work well for short trips.

Mr. F. D. Adams, Boston and Albany, favored the plan of admitting the air into the end of the car by means of wicket windows over the door, the entrance of dust and cinders being prevented by a projecting hood on the outside. The drop-sash in the door was objectionable, as it disfigured the door, was liable to rattle, and was more or less difficult to raise. Admitting air through the frieze was also objectionable, as it exposed passengers to a direct draught. The wicket sash over the end windows could be regulated by the conductor or passengers, and the projecting hood outside obviated the necessity for using wire screens.

Mr. John Kirby, Lake Shore and Michigan Southern.—There is one thing I omitted to say when I was up before. In the two cars I spoke of, there was a water-box in the corner of the car, and four openings in the car. The openings were common registers such as are used in a dwelling-house, with shutters to turn up. The great objection to those was, that passengers sitting in the immediate vicinity of these registers could not endure the strong current that came in, and would close the registers as fast as the conductors or brakesmen would open them. I suppose any one knows how unpleasant it is to sit in a strong draft, either in the face or from behind. There are four of those openings in a car, and if they produce too strong a current, how much more unpleasant would one opening bringing in about the same volume of air be! That led us to the adoption of the plan of which Mr. Wilcox spoke, of making eight openings on each side, which makes sixteen. In the moderate weather when passengers do not want their windows up, nor to have the cold air coming right in on them, by this plan of having the windows above the heads of the passengers, you can open as many as you please, and it keeps the air quite pure.

Mr. M. W. Dickerman, Concord R.R.—We have some cars ventilated on the side in the manner Mr. Wilcox speaks of, and these do very well. Mr. Adams speaks of the air striking all in one body on the passengers. To obviate that, in the last car we built, we took the air in over the foot-board to the funnel in the raised roof, spreading the air throughout the entire car, passing it over a stove in the winter-time, and giving us the best of air at all times. A short time since, I thought I would experiment with another car. We ran two construction-trains with about forty Irishmen. You know there would be some pretty strong air in their car. Those men worked hard, smoked poor tobacco, and ate large onions with their meals. I thought I would fix it in the cheapest possible way that I could. I took some ten-inch stove-funnel and put it on top of the car, running the entire length of the car. Then I made five openings with a damper and a bell muzzle on each end. This was covered with gauze to prevent the cinders from coming in. I put an old-fashioned stove-pipe damper in, so that we can let in much or little air, just as we please. When the door was opened, some of the men say that it actually took straw hats off of their heads, the current of air was so strong up through the ventilators. Now they talk of not letting small children into the cars for fear of stopping the ventilators. (Laughter.)

Mr. L. Garey, New-York Central and Hudson River.—I think we are somewhat unfortunate in not having the chairman of our Committee upon Ventilation present at this meeting. He is detained. I know incidentally that there have been some very interesting experiments tried on his road, showing the effectiveness of the present modes of ventilation. If I am not misinformed, although I see nothing of it in their report, they have burned powder in the cars running at certain rates of speed, opening all the exhaust ventilators and using all the other ventilation that was applied to the car, to see how quick the air would be exhausted, and in many instances they have carried the same air they started with from 15 to 20 miles. In other instances, with certain improvements of ventilation, they have exhausted it in seven minutes—that is, taken all the air out of the car and supplied it with other air. I am very certain that some of these experiments were not placed on record in their report, but perhaps it was for fear that they would say too much against ventilators that are now placed upon almost all the roads in the country. I know in a meeting held in our rooms, at No. 113 Liberty street, several months ago, a gentleman present made the assertion that he had tested in one instance air taken from the city of Portland, and carried to Bangor in the same car. He was positive of it. It had the appliances for ventilation that are usually used on many of our roads. The doors were opened only at stations where this train stopped, it being an express-train. If that is the case, I think we should know what ventilators in existence will take the air out and supply pure air. We should know this for our own benefit, and for the benefit of the community at large.

Mr. F. D. Adams, Boston and Albany.—Mr. Garey has alluded to some experiments that were made on our road. I have some knowledge of these experiments, although I was not present at all of them. I don't know that it is necessary to give any more detailed account of them than the committee have seen fit to report. There is no doubt that they were actuated considerably by the motives that Mr. Garey has alluded to. They knew very well that if they should denounce some ventilation that is used, they would get the ill-will of many, and perhaps suffer. But it is nevertheless a fact that these experiments were tried very thoroughly. The committee have taken a great deal of pains to ascertain all the facts that they could; and yet neither they nor any of the rest of us are fully satisfied yet. Some things, however, have been demonstrated beyond contradiction, and among these things are these exhaust ventilators talked about so much to-day. To speak in plain words, the whole thing is a humbug. I have got up on the seats and smoked, and in many cases I have found no air that would take the smoke out at any of these ventilators. If there happened to be an eddy, the smoke would go out with the air, and perhaps the next mile the air would come in. It does not create a steady draft out of the car. Practical demonstration shows clearly it does not do so. We have tried the lightest material. As Mr. Garey stated, we have burnt powder in those cars with the exhaust ventilators open and the wickets closed, and it would take 15 to 20 minutes before the air would be bearable. When the reverse was done, the air was cleared very quickly.

Another thing I have noticed day after day when I have been traveling on our road. Our express-trains are loaded very heavily. We have a large smoking-car holding some 70 passengers. They have a peculiar fashion in that section of the country between New-York and Boston of playing euchre, and the consequence is that the car is filled with smoke. When it stands in the depot, even if the wickets are open, it will be filled with smoke, so densely that you can not see from one end of it to the other. When the car moves out of the depot, let the wickets be open, and in five minutes the car will be comparatively clear, but with the exhaust ventilators open that are used to a great extent on the lines everywhere—we have got perhaps half a dozen different varieties now—the result is entirely different. We put them on more because there is a public demand, than because we believe they are good for any thing. I don't make any exceptions: they are all alike. We have got to get a current of air through the car, in order to clear it. There is no question about that in my mind, and the current of air received into the end does effectually perform that service. It is demonstrated beyond all dispute in the action on that road.

I will allude to one other test that we are trying there now. Our people have put into the hands of the company a car, and they have fitted it up at a considerable expense. The air is conveyed into the car by a board driven from one of the axles of the truck at a speed of twenty miles an hour; about a thousand turns a minute drawing the air into the car through a side window. This side window is covered with gauze wire, which is supposed of course to keep the cinders all out. The air is designed in the winter to pass over a hot stove, and in the summer over an ice-box. It is then taken immediately up to the top of the car and carried completely around in a tube perhaps six inches in diameter. That tube is at various points, as often as is deemed necessary, perforated with fine holes, allowing the air to pass out into the car, distributing it equally and evenly as far as possible. We found that at a high rate of speed, this worked very finely. I might say, in addition, that they exhausted the air through the floor by registers. Unfortunately, our road is very heavily graded, and we found that when we came to go up a long grade of 75 to 80 feet to the mile, with a heavy express-train, we did not make very rapid speed, and consequently got no air. That trouble occurred on hot days, and we felt like knocking the windows out with our elbows. But when we got to the summit of the grade and commenced going 45 miles an hour, we got abundance of air. On the Western roads which are level, that difficulty will not be encountered so much, so that arrangement for ventilation will be very acceptable with them. With a speed of 25 or 30 miles an hour, it works well, but there is a difficulty again. If the train stops long at a station, or if there should be a break-down, or the train switched off on a side-track, the passengers would swelter. They would necessarily have to get out or break out the windows. All these difficulties have to be overcome, and we are surrounded with innumerable troubles in order to accomplish ventilation on railroad-trains. There is no difficulty in devising a plan to ventilate a house, yet the various circumstances under which railroad-trains are placed make the difficulties to be overcome almost insurmountable.

Mr. S. Griffith, Indianapolis, Cincinnati, and Lafayette.—I think the time for exhausting the foul air is much less than any person would suppose, and I will state that we have a practical test of it by every train that passes over our road. There is a fertilizing factory established a few miles below the city on the road, which causes the air to be very offensive. The moment the train strikes this stench, the car appears to be entirely filled with it, but I don't think it requires a half a minute after the car passes through this stench before it is entirely clear of it, to all appearance. We have nothing except the ordinary exhaust ventilators and perforated plates; and this is the case in the winter, when the doors and windows are closed. I think that people generally are mistaken with regard to the time required to change the air.

Mr. J. M. Leech, Pittsburg and Connellsville.—I think that what we require is something that will force the air from the floor up, and not something overhead. The ventilation that we have had heretofore has been either on the end of the car, forcing the draft into our face, or else over our heads, forcing the air down. I think what we require is something below. We don't propose to fasten down the windows. We propose to fetch the air in, and every person can regulate it to suit himself. We also propose in the winter season, by forcing the air over the fire-box in the engine, to make it warm. In case the train is not in motion, there is a small stationary engine which will work a fan and supply air, either warm or cold, to fill the cars, giving all the air needed. I think something of that kind is what is required by the public.

At this point of the discussion, Professor Allen, of Philadelphia, was invited to address the convention on the subject of ventilation, but he declined doing so, and proposed to-morrow morning, before the regular meeting, as a more suitable time, as he would then be able to make some experiments with apparatus. His proposal was accepted, and further discussion postponed until to-morrow.

OIL-BOX AND JOURNAL-BEARING PATTERNS.

The Chair called for the report of the Committee on Oil-Box and Journal-Bearing Patterns.

Mr. C. A. Smith, late of Erie Railway, Chairman of the Committee.—I was not aware that the committee were expected to make any report here. I had no idea that the duty of the committee was to make a report. If I have omitted any duty, I am sorry for it.

Mr. L. Garey.—That committee was appointed with power to perfect this matter, and I think it essential that they should report what has been done.

MR. SMITH.—We have perfected every thing. We have drawings here to show. We have brought on a number of lithographs for distribution. Here is the report of the committee in this lithographed drawing.

MR. ADAMS.—I suppose that the wish of the Association in regard to the report of this committee is to know something of the history of this matter. I had a similar idea with Mr. Smith, that it was not necessary to write out a detailed report. If it is desirable that the committee should give an outline of their experience in arriving at their conclusions, of course they can do so. Most every body will understand that you can not get half a dozen railroad men that will agree in detail on every thing. We found there were a good many obstacles, but after talking the matter over, we arrived at the conclusion that we had got to make concessions to each other. We decided and agreed, as a committee, to adopt that style of oil-box, and we got out these lithographs. It required a good deal of labor and consultation among ourselves, and, as I said, concessions on the part of all of us.

MR. C. A. SMITH.—We did some time last winter get out a circular for railroad managers, superintendents, and presidents. I will have to beg the pardon of the master car-builders for not giving them a copy of the same, but I will see that they do get a copy of it. This pattern is in use now, more or less, upon some twelve or fifteen roads. I would propose that at the proper time we should investigate and find what it is doing, how it is operating in every way. Probably it is as well to let that go until another year. Then we will have a long time to find out just what its advantages are. In the next two weeks, I will send you all a copy of that circular which was sent to the railroad managers.

MR. ADAMS.—Can you state what roads will use it?

MR. SMITH.—I can not state from memory. There is the Boston and Albany, the New-York Central, the Delaware and Lackawanna, and a road in Canada. There are about 125 cars running on the Erie road with it.

MR. GAREY.—I would like to state a little of my experience with this large journal, so termed. I have yet to learn of one of them having become hot under the ordinary oiling of the roads that have adopted it, or are using it. There is certainly evidence that the friction is less with the $3\frac{3}{4}$ by 7 journal than with the $3\frac{1}{4}$ by $5\frac{1}{2}$. The cars move easier; it requires less power and less oil to run them per mile. In other words, there can be a poorer quality of oil used; that has been demonstrated within the last two or three months. On the New-York and Harlem road, they procured cheaper oil, and the consequence was that almost three quarters of the $3\frac{1}{4}$ by $5\frac{1}{2}$ journals came into the Grand Central Depot hot, while on the same train the journals $3\frac{3}{4}$ by 7 came in cool every one of them. Mr. Garey then read the following communications from C. E. Garey, M. C. B., New-York and Harlem Railroad, and B. N. Phelps, Foreman Car-Shops, New-York Central and Hudson River Railroad, 46th street, New-York City, in regard to the working of the standard axle journals:

L. GAREY, ESQ.:

DEAR SIR: I have watched closely the running of the large journal-bearings for the last six months, and can safely say that they will wear out four sets of the $5\frac{1}{2}$ x $3\frac{1}{4}$ journal-bearings now in use. I have every hot bearing reported, and always examine the brass, and up to this date we have not had a hot bearing of the M.C.B. standard, although these bearings run long distances with express-trains to Chicago, Buffalo, and other points. I have not had occasion to take any of them out as yet, which is an evidence of their great durability. I can, of course, say nothing in regard to wear of journal, having had no opportunity to examine it, but it must be less in proportion to wear of brass, as against the small journal ordinarily used.

Yours respectfully,
B. N. PHELPS, *Foreman.*

To the Master Car-Builders' Association:

GENTLEMEN: Not being able to attend your meeting at Cincinnati, I take pleasure in sending you the following statement of facts:

I presume that a majority of the members present will remember a report made by Mr. L. Garey at the last annual meeting, of an experiment made by him of different sized journals under the same car, all the bearings being of the same material and all cast at the same time. I desire to make a further statement in regard to the same car, which may be of some interest, although the original bearings were removed and taken to the Boston convention for inspection. Two pairs of the wheels, one with 7 x $3\frac{3}{4}$ journals, and the other with $6\frac{1}{2}$ x $3\frac{1}{2}$ journals, were left under the car which has been in constant service until May 22d, when I found it necessary to remove the wheels, as they were worn out, having run 65,734 miles. On examination, I found that the large journals had been worn off $\frac{1}{32}$ of an inch in diameter, and $\frac{1}{8}$ in length, but were perfectly straight, smooth, and equal in size, while the smaller ones, namely, $6\frac{1}{2}$ x $3\frac{1}{2}$, one was worn off $\frac{1}{16}$ in diameter, and the other a little less, and both were smaller in the centre than at the shoulders, while the lateral wear was the same as that of the large journals. I find, by experiment, that bearings on $5\frac{1}{2}$ x $3\frac{1}{4}$ journals will run from 30,000 to 35,000 miles, while the standard bearings, judging from the past twelve months' experience, will run with safety 100,000 miles or more, and with much less liability of heating, as we have several cars running with standard axle, and have not yet had a hot box. These experiments were made with New-York and Harlem R. R. baggage-car No. 10.

C. E. GAREY, M.C.B.

TREASURER'S REPORT.

MR. AARON STEINBACH, Treasurer of the Association, presented his annual report as follows:

REPORT.

The Master Car-Builders' Association:

In account with A. STEINBACH, Treasurer.

CREDIT.

By Balance on hand at last report	$518 18
" Receipts and assessments to date	477 50
" Interest	60 00
	$1055 68

DEBIT.

To paid vouchers herewith presented, namely:		
" Hire of Tremont Temple, Boston	$80 00	
" J. W. W. Yerrinton, for reporting	103 50	
" S. W. Green, printing annual report	298 26	
" John S. Willard	9 00	
" Pangborn, Dunning & Sears	28 15	
" Sears Brothers	21 00	
" Lithographing and Engraving Co	135 00	
" J. D. Orr & Co	50 75	
" Postage and stationery	50 32	
	$775 98	
On account of Dictionary:		
M. N. Forney	$158 70	
Engraving and printing	80 60	
Photo-Engraving Co	72 85	
W. E. Partridge	75 00	387 15
		$1163 13
Due Treasurer		$107 45

June 9, 1874.

The report was accepted.

ASSOCIATION ROOMS IN NEW-YORK.

The Committee on the Association Rooms, 113 Liberty street, New-York, reported the following statement of receipts and expenditures:

Receipts to date	$935 00
Disbursements as per vouchers herewith presented	643 36
Balance on hand	$291 64

June 8, 1874.

L. GAREY, C. A. SMITH, } *Committee.*

MR. L. GAREY, New-York Central and Hudson River.—I would say that we have placed a new carpet and all the furniture that is necessary for the next year or two, in the rooms of the Association, and we are now in condition to get along with only the expense of rent, coal, gas, etc. The rooms are open daily from morning till evening, and in the evening, if requested by any member who should chance to be in the city. They are free to any and every person who may feel interested in railroads, and it is used as a sort of exchange by the members and their friends who visit New-York. There is a committee-room attached, which is always at the service of the members who may choose to use it. The source of revenue is from advertisements placed in the Register, which is now in the room before you. I will further state that there are quite a number of interesting drawings and scientific books and papers that would interest any and all of you; and I would further say that there is no whisky or any thing of that kind in or about the place to my knowledge. (Applause.)

MR. F. D. ADAMS.—It is also very desirable, on the part of the Association, to have any and every one that has any new ideas, or drawings, or models, send a tracing, to be left at the rooms for the benefit of the members of the Association. There are, as Mr. Garey says, a good many drawings there that are interesting, and we would like to have as many more as we can get.

On motion, the report was accepted and filed..

SIZE AND FRAMING OF PASSENGER AND FREIGHT CARS.

The Secretary then presented and read the report of the committee on this subject, which is not in such form as to admit of its insertion here. It will be published in the official report of the proceedings.

MR. C. A. SMITH.—I was one of that committee. I supposed that our chairman would work up every thing, and have it all correct so that it would be submitted to the Convention in shape. I was sorry to find, when I came to Philadelphia on Monday morning, that there had been nothing done with it. The report, some of it, is very extensive. There is a great deal there. It would be almost impossible to read it, and it is not in shape. I don't see any one that we can blame for it excepting the President of our Association and the chairman of our committee.

MR. F. D. ADAMS.—With reference to the matter of that report, there is a great difference of opinion. What we want is to be educated up to the best proportions of timber in a car-frame. I would suggest that that report be referred back to the committee for further investigation and for report another year.

MR. M. P. FORD.—I move as an amendment, "with instructions to recommend suitable sizes for the frames of freight and passenger cars."

MR. ADAMS.—I will say that I didn't answer the questions sent to me, and I will give the reason why. For the last year we have been making some considerable changes, and experimenting a little in reducing the weight of our car-body. We are doing it intelligently, and we require time. That is the principal reason I had for not giving an answer to those questions. Next year, if I am invited to answer them, I will do so.

MR. F. CHILDS, Great Western, of Canada.—The committee must require what freight a road carries. On our road, we can't allow any body to dictate to us what to do. We know what the freight is we have got to carry.

MR. ADAMS.—I am ready to concede that various roads are called upon to do various services, and consequently will need cars perhaps for some service expressly; but what we want to get at is, how small an amount of timber and iron will carry a certain amount of tonnage safely, without liability to break down. I think that is the idea. We all of us understand perfectly that it costs money to haul any thing over the road, and if we have got an additional tonnage that don't pay—what we call dead weight—we want to rid ourselves of it. It is our duty to ascertain the utmost possible reduction of dead weight. As I have said before, I am not in favor of reducing the cars down to a weak point, but I am satisfied that we have been building our cars unnecessarily heavy. We have in our shop within the last year lightened our passenger-cars some two or three tons, and I intend to lighten them a ton or a ton and a half more; and I believe to-day that they are just as safe as the cars that were built with an additional tonnage.

MR. FORD.—I think the objection of Mr. Childs might be made with reference to the report of every committee here. We don't expect to instruct the members of this Association as to what they shall do positively. It is merely a recommendation.

MR. CHILDS.—I think, when we discuss ventilation, that is something we can all benefit by—lighting and heating cars also; but when we discuss the dead weight of cars without first discussing the weight these cars have to carry, then we are off the track. In the last two or three years, the Great Western road has had built 300 cars, 33 ft. long, on purpose to carry lumber. I suppose Mr. Adams would not say that these cars should be built with the same frame as a car 29 ft. 6 inches long.

The motion of Mr. Adams as amended by Mr. Ford was adopted, and the report recommitted with instructions.

COMMUNICATIONS.

A communication was received from W. S. Munson, President of the Young Men's Mercantile Library Association of Cincinnati, extending the privilege of their rooms, papers, and works of reference to the members of the convention; also a communication from Gest & Atkinson, inviting the members to visit their lard-oil factory in Eggleston avenue, which invitations were accepted with thanks.

TRUCK AND CAR-BODY CHECK-CHAINS.

The committee on this subject made a report, which was read by the Secretary, as follows:

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your Committee on Truck and Car-Body Check-Chains respectfully report, that about 350 copies of interrogatories were issued by us in the form of a circular. Twenty-five replies were received, a large proportion of which were from persons who are not members of the Association.

[The committee give the replies to the various questions in detail, and conclude as follows:]

In giving a statement of the answers received, your committee have endeavored to give the substance of them as nearly as practicable, without using the precise language of each individual. From these answers, it will be seen that a majority of those who favor us with their opinions are in favor of the use of check-chains, and a part of those who are not so decidedly in favor of their use, are of opinion that they would be desirable if they could be so constructed as to avoid the weak points that are so apparent in a large proportion of the chains and fastenings as now applied.

Your committee would like very much to give the views of several of those who have written in full upon the subject, but space will not permit; we will therefore briefly point out some of the defects in the application of the chains and fastenings, etc., and also make some suggestions looking toward an improvement.

Check-chains, as usually applied, with eye-bolts through the truck sides and sill of car, are defective from being so placed that the full strength of the timber is not available, as the strain is down, and sideways on the sill, and usually tears out the lower portion of it, leaving the upper part in place, and with the truck *vice versa*. Where hook or eye plates are bolted to truck side and sill, the strain bears on the bolt nearest to the hook or eye, and the result is, that either the bolts or timber break and give way in detail, and in cases where lag or wood screws are used, the result is the same.

In order to have check-chains of value, they should be of such proportion that their strength will be equal to the resistance of the timbers to which they are attached, and the fastenings to the timber should be so constructed that the full strength of the timber would be utilized. The point of attaching chains to truck and car-body respectively should be such that the chains would be at right angles to the body of the car when the chains are drawn taut, and the length of chain just sufficient to admit of running the shortest curves with safety.

Your committee think that it is not necessary to dwell on the size of iron or length of links in check-chains, and will pass to the matter of their attachment to the car-body. There are different methods of attachment to the sill or a special timber, so that the full strength of the timber can be made available. One method which your committee would recommend, is to place an iron plate of suitable size and strength on the inside of the sill with an angle turned over, and extending half across the top of the sill, and an eye to receive a ring at the lower end of plate near the lower inside corner of sill; also a similar plate on the opposite side, with an angle extending half across the top, and another angle at the lower outside corner; the plate extending across the bottom of sill to near the inside corner, with an eye to receive the ring above referred to; then by bolting through the plates and sill, and the ends of the plates being drawn together by the ring passing through the eye near the ends, the sill or timber is securely inclosed, and with the irons properly proportioned, its strength is fully utilized. Without occupying further time, your committee would recommend the adoption of the following resolution:

Resolved, That truck and car-body check-chains are, when properly applied, a valuable acquisition on passenger equipment, and your committee recommend their general use.

Respectfully submitted.
H. O. WADLIE,
Chairman.

MR. H. O. WADLIE, Illinois Central, and chairman of the committee, requested Mr. Adams to explain some drawings submitted with the report, and which were received from the Boston and Albany road.

MR. F. D. ADAMS.—Our manner of applying the check-chain is somewhat different from any other road. We make a plate of iron that is ¾ of an inch in thickness, and 3 inches wide, and bolt it on to the two platform sticks, the timbers to which the draw-bar is attached. This represents the edge view with two heavy hooks sledged down and forged up, making them very strong. Those are secured by two ⅞ bolts, causing the strain to be upon two timbers instead of one whenever a truck is thrown from the line of rail. Our chain is a ⅝ chain of the best material we can get, with a very short link, giving it simply slack enough to turn off cars on our main line of road. Whenever we get into a branch, we unhook our check-chains; but it will allow the cars to turn into an ordinary switch or any ordinary side-track. In that way, we claim that we get an unusually strong attachment, stronger than I have seen anywhere else, I think. It is very simple. The chain running from the corner of the truck to the centre of the car gives a more direct line of resistance when the truck is thrown from the rail than it does if it goes from the corner of the truck to the sill. I have heard a good many advocate the idea in relation to the check-chain, that it was put on for the purpose of holding the truck from falling down on the rail in case the axle broke, or it went off the track. I don't conceive that to be the idea in a check-chain. My idea is that check-chains are mainly meant to keep the truck from getting crosswise the rail and tearing the truck to pieces, and giving an incline to it down the bank. Speaking about experience of accidents, we had one the week before I came away, in which, I believe, the use of check-chains saved the loss of some lives and prevented the destruction of a car. The rail was broken, and our train-men were fully convinced that the check-chain saved the car from going down the bank. It kept the car perfectly in line, and didn't give way. We use two check-chains to a truck; we have found that to be sufficient.

MR. E. VARNEY, Fitchburg R. R.—We use check-chains on every thing, but I don't know as I am prepared to say whether they have done any particular good or not. We had one passenger-car thrown off the track by a broken rail a year ago last winter, a twenty-ton car. It ran some five or six times the length of the car along the bank, hit a culvert, broke it loose from the train, and rolled down the bank with the wheels on top. Whether or not the wheels would have left the car if the check-chains were there, I don't know, or whether it was any benefit having the trucks go down with the car. All I know is, it went down there. There were eight passengers in the car, and nobody was hurt. I went and jacked the car up, put it on the track, hauled the trucks up and put them under, and rode down with it 50 miles without any more repairs than that.

MR. S. GRIFFITH.—I will state one instance that occurred on the Indiana and Cincinnati road, where a coach was rolled over and the check-chains held the truck to the body of the car. The car went down a 40-foot bank, and into a pond of water deep enough to enter the windows. If there had been nothing to hold the truck to that car, and the car had landed into that water, I presume all the passengers in the car would have been drowned. I have known instances where cars have left the rail and gone down an embankment, and the trucks still remained on the body of the cars without check-chains. I don't know that it is of any advantage for the truck to remain with the body of the car. I know it is a serious disadvantage when you want to get the car on the rail again. I have known an instance where the car left the track with check-chains—there being only two chains, as is usually the case. The end that had no check-chains was the forward end at that time. The car left the track, and the result was that the truck turned over and the check-chains broke, and the truck was the cause of throwing off the balance of the train. If the check-chains had not been there, the truck would not have turned over. It has been a question with me whether check-chains are of any benefit whatever, with a passenger equipment.

MR. D. SUTHERLAND, Detroit Car-Works.—If two chains are put to a truck, they must be strong enough to retain that truck in its position. If four are put there, let them be proportionately light. In regard to the use of them, about two years ago I witnessed a run-off, which, had it not been for the check-chains, would have caused three trucks to turn over.

MR. ADAMS.—I don't know really but what four chains are necessary. I believe in putting them on strong, and will put on four chains if I am fully satisfied that they are a safeguard. My reason for putting them on only at one end has been mainly that it is almost an impossibility to get two chains on the opposite ends, both of precisely the same length and drawing alike. If Mr. Rowe is right, that the chain on the hind end of the truck would not keep it in line, it is absolutely necessary to have them on both ends. It is possible that the forward end of the truck might go off, and the hind truck remain on. On the whole, I will say now, after what I have heard, that I go in for four check-chains. We now use them attached to the outer end of our trucks, and if we conclude to use four, we will apply them on the rear or inside end of the truck, and attach them to the two centre sills. We frame our cars longitudinally, using six intermediate sills. The two middle ones are four inches thick. I don't understand that the object of the check-chain is to prevent the car from turning over.

MR. GAREY.—I would like to give a little of my experience in the check-chain business. Some fourteen years ago, when I was connected with the Harlem road, I had an order to put two check-chains to each truck of all our passenger equipment. I think that the third car out went off the track on account of a broken rail, struck a culvert, tore the track from under the car, split the sills out, broke them off, broke them all to pieces. Some three or four weeks after that, we had a similar occurrence, only the truck turned over, and dragged along the track. It chanced to be the hind car. The balance of the train was drawn off the track by swinging down the bank. The forward truck was torn out, and the car was dragged on its side, strewing the passengers all along the track. Fortunately, I believe, but two were killed at that time. The following week we had two trains off the track on account of broken rails. The cars were without check-chains, and I can safely say that those cars were damaged much less than those provided with check-chains. There were no passengers hurt. With that evidence before them, the officers of the road immediately gave me orders to remove the check-chains from all passenger-cars, and the road has never used a check-chain since. It has occurred to my mind, in listening to the discussion here, that it would be a very nice mechanical operation to apply four check-chains, so that the four would come in play at the same time. I do not question the value of check-chains, or some appliance to accomplish the object that you have in applying them. If some appliance could be obtained that would confine the truck to the body, permitting it simply to go round the curves, and no more, that would hold it to the body under all circumstances, as long as the body was intact—it seems to me that would be a grand thing to accomplish.

MR. ADAMS.—Mr. Garey alludes to his accident as being very disastrous. If I understand his remark, he attributes it to the check-chains. I understood him to say that the truck dropped into a culvert. In the next case, where his car went off the track, and he had no check chains, it was not so bad; but he didn't say any thing about dropping into a culvert. We can not, of course, expect to meet all the variety of circumstances that occur on railroads, and I am well aware that what would be a very great advantage in one case might, under certain circumstances, be a peculiar disadvantage. I understand that perfectly well. I have not had perhaps so long and peculiar an experience as Mr. Garey, but in my experience I have come to the conclusion fully, and believe that check-chains are an absolute necessity for safety, taking the circumstances as we meet them, and I believe that the public generally feel a certain amount of safety if they see the chains put on in a secure and substantial manner. Yet those very safeguards may in certain cases be greatly to the disadvantage of the company. It is not those exceptions we are required to look after.

MR. W. E. PARTRIDGE.—There are certainly sometimes check-chains put on where the iron is wasted, and its strength wasted. Very often we have from the forward corner of the truck a check-chain extending to the sill, but instead of going out directly to the side-sill, it is carried forward from the side as though it were a leading chain. The consequence is that the tendency to turn is at right angles with the sill. The pressure is directly outward, or very nearly so, and the chain extending forward some distance, is holding at an angle, and the consequence is that the chain receives a great deal more strain, owing to that angle, than it would if it extended from the corner of the truck directly in, or if it extended from the corner of the truck directly up to the sill, and came as nearly as possible in line with the strain. In other words, if we stretch a cord from one point to another, and then put a pressure at right angles to that cord, we can break it much easier than we could if we put the same pressure in direction with the length. I have seen a number of chains where the actual strain upon the chain itself was from 50 to 60 per cent more than the force acting at the truck corner.

MR. CHILDS.—We have had a good deal of discussion about check-chains. Those gentlemen who have given us so much information on this subject will oblige me by telling me the effect that all these run-offs have had on the king-bolt; and if the king-bolt is broken, I want friend Adams to show how it is that ⅝ iron will stand more than two inches. If it is bent, I want him to tell me how he can turn his truck.

MR. ADAMS.—When a truck goes off the track, the strain may be brought upon it very heavy and strong indeed; but wherever the strain is brought to bear most, of course the effect of that strain will be the greatest. We use what I suppose Mr. Childs terms the king-bolt, or centre-pin, but we also have, in addition to that, a centre-plate, which is a heavy body of cast-iron that will stand a great deal of resistance. In an ordinary run-off, simply falling off the rail, unless the car goes into the culvert, as Mr. Garey mentioned, the resistance to the motion of the truck would not in ordinary cases be of sufficient force to break or bend the king-bolt, and if it did, that bending or breaking would cause the check-chain to give way.

MR. CHILDS.—In that one case where the king-bolt was broken, were the check-chains still perfect, or were they broken?

MR. ADAMS.—I have not in mind any case where the king-bolt was broken. It is very seldom we have cases of that kind. Where the cars ran off the track, I don't call to mind a single instance on our road where the king-bolt has been broken; but I do call to mind an instance where the check chains held the car, and the king bolt didn't break.

MR. D. S. DOCKSTADER, Atlantic and Great Western Railroad.—I have had considerable experience in this matter; have unfortunately been connected with a road that has had a great many accidents. I have done a great share of the wrecking on that road, on two divisions, and on a branch connected with the road. My experience has been that in a great many instances the check-chains have been the cause of saving passenger-cars from running down a bank and upsetting. In one case, just as the train was passing over a bridge, the locomotive exploded. We had on two express-cars and three passenger-cars. The whole train was wrecked. The rear car was full of passengers, and all that saved that car from turning

over into the lake was the check-chains. The car was so far turned over that it was just on the balance.

Another instance occurs to my mind. In the rainy season, we had a storm that washed away a bridge, and the locomotive rolled over, and we had five passenger-cars piled up, and one of the cars ran over the bridge and merely held by the check-chains. In many instances of freight-trains, my experience has been that cars would run a half a mile and get off the track as far as the check-chains would permit them to run. These are some of the instances that occur to my mind at the present, and I am greatly in favor of check-chains.

MR. CHILDS.—At what speed was the train running when those first run-offs occurred?

MR. DOCKSTADER.—In the first case I spoke of, it was our mail-train, running 20 or 25 miles an hour. In the case where the water washed the bridge out, the train was running at the rate of 25 or 30 miles.

MR. KIRBY.—Three years ago last winter, a wheel broke on one of our drawing-room cars. It was the rear car in the train, and was locked up, nobody being in charge of it. The wheel broke about seven miles west of Sylvania. There was a freight-train standing at Sylvania, and the corner of the drawing-room car being eight or ten inches out of line, struck the corner of the freight-car. The train was stopped, and there was no damage except that broken wheel. We tracked that wheel back seven miles. I went down the next morning with a wrecking-car, slewed the truck round in line, put a piece of timber on to the safety timber, so as to prevent the broken part of the axle from working back on the box, and put another pair of wheels in. There was a check-chain to each corner of the trucks. That shows that if your check-chains are properly applied and strong enough, they will not allow your wheels, all of them, to leave the track.

A year ago this last winter, the express-train was going into Chicago. There was a broken wheel under one car. Those were four-wheeled trucks, and the broken wheel took that pair of wheels off the track just as far as the check-chains would allow them to go, but that was not far enough to let the forward chains off. When they stopped, there was just the pair of broken wheels off the track.

A year ago last winter, on the Sandusky division of this road, some men had stolen a hand-cart. When the head-light of the engine that was following them got pretty near, they jumped and left the hand-car on the track. The engine struck it and broke it to pieces, and that turned the baggage-car and two coaches off the track. They ran along the side until they stopped. When they stopped, the chains were all taut on the outside. Undoubtedly, if it hadn't been for the check-chains, the cars would have tipped over.

Last winter, the train to Chicago, at 2 o'clock in the morning, met a broken rail. The baggage-car and the engine went over it. The next baggage-car, the second-class car, and two coaches went off and ran just along the edge of the embankment. When the train stopped, the porter waked up his passengers, and said: "You must get up; we are off the track." They were quite indignant, didn't know any thing about it; but if it hadn't been for the check chains, probably those in the upper berths would have taken positions in the lower ones. This is my experience with check-chains. We put four to each truck, and attach them to the outside sill, so that if you get off the track, you get the benefit of the weight of your truck. Some gentlemen here cited cases where the cars went off the track and turned over and took the trucks with them, and that was caused by having the check-chains attached. They thought if there hadn't been any check-chains, the cars would have gone down without the trucks, but there is no apparent advantage there.

MR. VARNEY.—We had a break on a four-wheeled truck, and they ran four miles and a half before they discovered a wheel was broken. One gentleman in the car remarked to the conductor that he thought they must be running across lots. When they got to the station, it was found that a wheel was broken off. The car had check-chains attached to the outside sill and it was all safe.

MR. A. STEINBACH, Philadelphia and Reading.—We have a wrecking-master, and he some time ago keyed our trucks fast to the bottom so as to hold the truck firmly. We have heavy rolling-stock, and have had a number of accidents, but I have learned that the fastening of the truck to the body is important, and all the check chains I have ever seen are not so good.

MR. CHILDS.—I have ridden in a car myself that ran over two cattle-guards with both trucks off the track. We ran on the timber that is put down to carry the rail. We didn't come to any harm at all. We had no check-chains. I wouldn't like to try it again, however. Another remark I would like to make is, that you seem to do your running off very scientifically. We do it very rough. Practically, you can't get up all these little nice points.

MR. KIRBY.—The first duty of a railroad officer after an accident, as I understand it, is to ascertain the cause. It is a good plan to do that, and find out what would have prevented the accident.

MR. CHILDS.—That would be all very well, but when you have got two or three people lying round with their legs broken, I think we had better attend to them first, and let the cause rest a little.

MR. GAREY.—While I agree with Mr. Kirby as to finding out the cause as soon as possible, I think if he had 15 or 20 cars waiting to pass some point, he would find it advisable to clear the track before hunting long for the cause. It is utterly impossible under many circumstances to hunt for the cause until you can remove the *débris* and permit the passengers to pass on their way. I have in my mind an accident which occurred at the drawbridge at Bridgeport some 22 years ago. The engineer, when he left the station, commenced to put his overalls on. While he was doing so, having a very heavy freight-train, he forgot to look to see whether the draw was on or off. The consequence was that the locomotive dropped over the edge of the bridge, and pitched him with the engine and fireman and some six cars into the river. There was one car that hung balancing on the bridge. It had no check-chains at all, but it hung right there. Had there been check-chains on the car, we might have supposed that they prevented it going into the river. I recollect an instance on the Naugatuck road, where the train came to a bridge, and the locomotive went off the track, and took about 60 feet of the bridge with it, and left the first passenger-car balancing, a part of it off the bridge and part of it on. There were no check-chains there, and the passengers all escaped without injury. The two baggage-cars went down into the river. I think something besides a check-chain is required. I think there must be some mechanical appliance other than chains to do this work—that is, to accomplish it successfully; and I wish that some of our men who have plenty of time and abundant talent, would take this matter up and see if they can't furnish us before the next annual meeting with some device that will have all the advantages of check-chains without any of the disadvantages.

MR. ADAMS.—Mr. Garey has related several accidents, but I fail to see in either one of them any application or analogy about the check-chain whatever. He tells us that they went off the track into a drawbridge, the cars directly running along. Certainly the check-chain is not made to hold the car under such circumstances at all. Nobody expects any such thing, there is no sort of application. As a natural result, if the drawbridge is open, the cars will go down. I want to say one word in relation to looking after causes. I think that is not particularly pertinent to check-chains, but still it has a bearing on the matter. It is important that we find out the causes of accidents in order to learn how to prevent them. It is most generally the fact that there are some officers of the road who go with a wrecking train. It is the business of the wrecking-master to get the wreck out of the way as soon as possible, and while he is making his preparations, there is always an opportunity to examine and see what the cause of the accident was.

MR. FORD.—I look upon this as one of the most important questions that can come before us, and I don't think the time is unprofitably spent in its discussion. If we can decide whether, on the whole, check-chains are a measure of safety, not only to railroad property but to the lives of travelers, it seems to me we are deciding something which is of very great importance. There is one thing I have observed, and that is, that those who have had a great deal of experience with check-chains are the most in favor of them. Those who are the most familiar with them are the most fully determined in their own minds as to their beneficial effect. I don't think we are to decide this matter on what might happen in one or two instances. There are exceptions to all rules, and I believe there are exceptions to the rule that check-chains are beneficial. There may be cases where it would be better for the check-chains to be off, but the question is, are they, on the whole, a matter of safety, a preventive of serious accidents, and a means in some cases of saving lives? If they are, we ought by all means to adopt them. I can not help feeling, from what I have heard, that they have been shown to be, in a large majority of cases, a help, and certainly not any disadvantage. But there is one important question in regard to this matter, and that is the best method of attaching them. Our friend, Mr. Adams, speaks of attaching them to the centre stringers of the car. I question the propriety of that. We want to make the most of our check-chains. It has been shown very clearly to my mind that in several instances they did prevent the trucks from swinging round and running at a sharp angle from the track. But in a case where the axle drags or the wheel drags, I believe that the plan of attaching them to the side-sill would be an advantage, because the tendency would be, if the chains were of proper length, to hold the corner of the truck up. They might not do that in every case, but if in some cases they will do it, it is an object to put the check-chain on the side-sill instead of the two middle stringers.

MR. WADLIE.—I don't know but what this subject is exhausted, but I will just say that I would feel safer in case of derangement if I knew there were four good check-chains applied to each truck. Mr. Garey has mentioned a case where he thinks check-chains were an injury, from the fact that the truck, striking into a culvert, turned over. As I understand him, this was the rear truck of the car, and the check-chains being on the rear end of the truck, the most natural consequence would be for the check-chains to even assist in rolling that truck over when the forward end of it went into the culvert; but apply the check-chains to the other end of that truck, and I think you have increased the safety of the passengers and car.

MR. J. D. MCILWAIN, Lake Shore and Tuscarawas Valley.—I have had a little experience with check-chains in the last year and a half, and I have found, in all the wrecks we have had, that those cars with check-chains came out of the wrecks with less damage invariably than those that had none. Even in the case of broken wheels, we have never had a car with a broken wheel that had check-chains on go in the ditch, but there have been three or four instances of cars that did go in the ditch when they had no check-chains on, which has convinced me that the cars of a railroad company are not properly equipped without four check-chains. Certainly they should be properly put on, and not in tow-string style. Something has been said about check-chains being fastened to the outside sill. That brings to my mind an instance given by a master mechanic—I think it was on the Little Miami road. On their engine-trucks, I believe, their check-chains go to the centre, and he stated a case where a wheel broke, and that side was held up, the bearing being naturally to throw the flange of the other wheel against the rail, because the check-chain on the broken wheel side had all the strain, while if it had been fastened outside of the wheel, it would have drawn the wheel off the track inside of the rail.

The discussion here closed, and the report of the committee was accepted. The resolution recommended by the committee was also adopted.

CAR-ROOFS.

MR. C. A. SMITH, from the Committee on Car-Roofs, presented the following report, which was read by the Secretary:

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your committee on the subject of car-roofs beg leave herewith to submit their report. The committee, soon after its appointment, sent circulars, soliciting information, to all master car-builders in the United States and Canada. Many replies were received that were very elaborate, and covered every essential point suggested by the subject; others were received that went less into details, but were nevertheless valuable to the committee. For the aid and assistance thus afforded, the committee would return their hearty thanks. To those who returned the circulars with the blank lines mainly filled with yes or no, we feel constrained to say that they might just as well have been returned unanswered, as the information conveyed was of no practical service.

Your committee need not dwell upon the very great importance of this subject to railroad companies. The best of car-roofs now in use are liable to get out of order and leak, and whenever this occurs, the damage to valuable freight is a serious tax upon the earnings of traffic. Upon analyzing the replies to the circulars, it appears that tin is used exclusively for the roofing of passenger-cars. Most of the roads use the M. F. tin, 14 × 20, lapped, pounded down, nailed, and soldered. Some roads use 8 nails to a sheet, while others put in from 10 to 18 nails to a sheet. Tin is considered to be the best material for the roofs of this class of cars. A large majority of the replies to circulars recommend mineral paint as the most durable and economical for roofs; some recommend lead and oil as the best, without regard to cost; others recommend a paint made by E. S. Alexander, of Chicago; while others prefer Venetian red and oil, and also boiled oil and yellow ochre.

Your committee find that but two kinds of roofs are in general use for freight-cars, namely: the Winslow roof and the tin roof. Other kinds are also used, but not to any very great extent. But one important road is reported as using exclusively, or nearly so, the so-called double-board roof. Other roads use and still continue to use this style of roof, but they experience much difficulty in keeping them tight. Most roads that have used them heretofore have ceased to do so, and have substituted tin or the Winslow roof in their stead; and your committee is of the opinion that they should be entirely abandoned for something more reliable. The principal objections to

the double board roof, as stated by those who have used it, are as follows: If the boards are dry when put on, wet weather will swell them so much as to make them bulge up at the joints; if, on the other hand, they are not seasoned, the dry weather will cause the joints to open and admit dust and cinders, and in time the boards decay. Another trouble is the rusting and breaking of nails and screws. The nails will work out, whether rusted or not. A few roads that have used this roof claim that it is as good as any in use, but that all roofs now in use are very difficult to keep in good condition.

Your committee find that the so-called Winslow roof is used very generally on many roads, many of these being important trunk lines and transportation companies. With but few exceptions, the roads using it indorse it, and say it is the best they have tried, that it is less liable to break than others they have used, is easily repaired, and more durable, when made of good iron and well painted. Some important trunk lines that have used it largely, report them to be good after eight or ten years of service. Many roads have had them made of galvanized iron, which, it is claimed, will last as long as a car will last; and two car-builders are of the opinion that in many cases the iron is good enough to be applied to a second car. From the large number of these roofs furnished to railroad companies during the past seven years (over 27,000), your committee conclude that the Winslow roof has great merits, especially when made of galvanized iron, for the reason that railroad companies would not use a roof that would cause great damage to freight by leakage.

Your committee find that many roads use the tin roof for freight-cars, and most of such roads claim that it is the best kind of roof for such cars, that it can be easily repaired, that it does not cause damage to freight, that it costs less for original construction and to keep in order, and that it is lighter than any other in use. Some report this kind of roof as lasting twenty years; others estimate their life at three years, there being great diversity of opinion upon this point, as well as upon their general merits. Some roads say it is very liable to break, and requires constant repairing after the first year of service, and that the sheets soon crack or break over the door-ways by the working of the car when loaded. That there should be considerable diversity of opinion is not surprising when it is considered that the replies received by the committee came from all parts of the country, and from points so far asunder as to embrace different climates, vicinity to the seaboard, as well as the remote interior where the salt-water air could have no effect.

The attention of the committee has more recently been called to a corrugated zinc roof made at Nashville, Tenn., and which has been in use about two years. We can not report as to its durability, but are inclined to think it has merits which are worthy of the attention of car-builders and members of the Association.

The committee would say, in conclusion, that in making this report, they have embodied as far as they were able to do so, the views of the master car-builders who have replied to the circulars of the committee.

C. A. SMITH,
GEORGE HACKETT, } *Committee.*

MR. F. CHILDS.—How is it that we have got so many half recommendations? Our constitution says we shall not mention patents.

MR. L. GAREY.—At one time, our Association was very fearful of saying any thing about a patented article of any kind, but we know now that we must of necessity use many patented inventions. While, as Mr. Childs says, our constitution prohibits a patentee or his agent from coming into the Association and advocating the adoption or sale of any patented article, I fail to find any thing in that instrument prohibiting any member from recommending any patented article, if it is in his opinion the best in use. I think there is too much hesitancy on the part of members to say just what they think about patents. I fail to see any thing in the report recommending any roof of any kind. It simply gives the number of roofs of certain kinds in the country, and I hope that the members will not be afraid to say what they think about all these roofs, whether patented or not.

MR. CHILDS.—I will simply say that down at Richmond, I complained of being called to order for mentioning a patent. I said then that we had to use a great many car patents, and we had our choice of them, and Mr. Adams said positively that that was not allowed.

MR. SMITH.—I would like Mr. Childs to state what he conceives to be the duty of any committee after they get their reports from car-builders.

MR. CHILDS.—Their duty is to act impartially entirely. If they do not mention one patent, they should not mention another.

MR. W. W. WILCOX, Chicago, Burlington and Quincy R.R.—It strikes me that Mr. Childs is laboring under a misapprehension. I suppose that the committee were instructed to send out circulars to all the car-builders in the country and obtain information. That committee, as I understand it, have discharged their duty faithfully. They have given the experience of all the car-builders in the country with regard to these roofs. Their report does not recommend any thing. It is simply a statement of facts and experiences.

MR. F. D. ADAMS.—In relation to my ruling at Richmond, at that time I undoubtedly got the impression, from the remarks Mr. Childs made, that he was violating the constitution, and I made my ruling in good faith. It is certainly true that we have got to deal with patent rights. If we made a mistake two or three years ago, let us correct it now, and not go on and make greater mistakes. In order to make progress, we have got to investigate all these patents, and the experience of mechanics will lead us to adopt those that are the best. As I understand the object of that provision in the constitution, it was to prevent any patentee from coming in here to intrude upon the convention. That was what we proposed to rule out. I apologize to Mr. Childs if I offended him.

MR. CHILDS.—I accept Mr. Adams's apology. I am very sorry that I placed so much confidence in his ability at that time.

On motion, the report of the committee was accepted and placed on file.

ASSESSMENTS.

The Committee on Assessments submitted the following report, which was accepted:

To the Master Car-Builders' Association:

Your committee appointed to make an assessment upon the members of the Association would respectfully report, that in view of our present indebtedness, and in anticipation of our increased expenses in publishing our dictionary of terms, we feel compelled to recommend an assessment of ten dollars upon each member.

F. D. ADAMS,
R. ATTRIDGE, } *Committee.*

The Convention then adjourned until to-morrow.

THIRD DAY'S PROCEEDINGS.

The Convention met pursuant to adjournment.

Before the Convention was called to order, Prof. J. G. Allen, of Philadelphia, in pursuance of the invitation extended to him yesterday, addressed the members for half an hour on the subject of ventilation, and illustrated his views by a number of experiments.

DICTIONARY OF TERMS.

The committee on this subject submitted a report made to the committee by Mr. W. E. Partridge, who is engaged in the work of compiling the dictionary. The report of Mr. Partridge states that he had been engaged in the work since last December, at which time all the drawings, papers, and other documents pertaining to it were placed in his hands. Some specimen pages of the work, showing its style and general plan, were also presented with the report. The difficulties attending its progress are pointed out in detail, and shown to be far greater than was anticipated at the outset; and the necessity of aid and co-operation on the part of car-builders, in order to insure an early completion of the work, is also dwelt upon in the report, which is too long for insertion here.

MR. M. P. FORD inquired how soon the dictionary would be ready, and what was wanted from car-builders to insure its early completion. If drawings of trucks were necessary, they could be obtained, he thought, without difficulty. The various kinds were not so numerous that drawings of all of them could not be had with proper effort. This work had now been in hand two or three years, considerable expense had already been incurred, and he felt anxious that it should be completed at the earliest moment, as it was very much needed, and any thing that the car-builders could do to hasten its progress should be done.

MR. V. D. PERRY had looked over the specimen proofs furnished by the committee, and, so far as he could judge from an examination of them, there seemed to be a good deal of unnecessary labor bestowed upon the work. It contained a good many cuts and illustrations that seemed to him to be of very little use, and not likely to be needed. What we wanted was such a representation and arrangement of the essential parts of a car, with an appropriate name for each, as would put an end to the present confusion arising from a variety of names for the same thing. He thought, if the advance sheets exhibited were a fair specimen of the entire work, it would contain much that was superfluous.

MR. L. GAREY said that the great majority, if not all, who were waiting for the completion of the work had no adequate conception of the labor involved in its preparation. He was a member of the committee, and knew from practical experience the difficulties which had to be encountered. They increased at every step of its progress, and what seemed a very easy and simple thing to outsiders, whose position enabled them to take only a superficial view of the matter, was found to be a very difficult and complicated one when practically taken in hand. As for the engravings, he thought every one of them was necessary, and would prove to be so when the book came to be used.

MR. W. E. PARTRIDGE said, in reply to the inquiry of Mr. Ford, that it was not necessary to have a drawing of every truck, but it was absolutely necessary to have drawings of some which they had not now got. There were trucks in use in various parts of the country, North, West, and South, which had marked peculiarities; and some of these were never seen in New-York. There were points in them that were not understood except in the section or locality where they were built. Many of these points were important, and should not be left out of such a work as was now in preparation. They had peculiar names, also, which should be known in order to be changed, confirmed, or modified, if deemed advisable, to give symmetry and completeness to the general classification.

MR. F. D. ADAMS said he was the originator of this undertaking, and was also a member of the committee having it in charge. He did not at the outset have any idea of the labor to be performed or the time required to complete such a work. This, as experience had proved, could only be developed as the work progressed. As a matter of comparison, he would say that the elaborate report of the Committee on Ventilation, presented yesterday, did not require a hundredth part of the labor expended in getting up this dictionary. Had he known what was required when he suggested such a work, he never would have made the proposition. As for the expense, he believed only about $300 had been paid out thus far, and whatever the ultimate cost might be, it was quite probable that the dictionary, when finished, would not only pay for itself, but prove to be a source of revenue. A proposition had been made to insert advertisements in it, but this was objected to by some as inexpedient. We had waited a long time for the dictionary, a very long time; in fact, we had never had one. A single year isn't much, under such circumstances; and surely we ought to exercise patience and forbearance, in view of the magnitude of the work, and of its great and permanent value when we do get it. The committee had worked hard and spent a great deal of time, and were just as anxious to finish the work and get it off their hands as others were to receive it.

MR. C. A. SMITH said the work had been delayed by the non-compliance with the request made last summer to send plans, specifications, and names of different parts of cars to the committee. He could remember but two instances where plans were reported in such form and detail as to be of material service to the committee.

MR. V. D. PERRY wished to know what use it would be to the committee to report the names of parts, if every car builder had a different name for each, when the committee was to determine the names.

MR. F. D. ADAMS referred to the circulars that were issued, soliciting general information, by other committees. The opinion of members of the Association was wanted, to enable the committee to act intelligently in determining the names to be adopted. A vocabulary was wanted from which to make a selection. The committee did not want to make a dictionary to suit themselves merely, but to suit as far as possible the entire Association. They wanted an expression of opinion, and whatever could be furnished in the way of material to enable them to reach the best conclusions.

A motion was made to limit the time for the completion of the dictionary until the next annual meeting. Six months was also proposed; but the motions were subsequently withdrawn, and the committee are consequently subject to no restriction as to time.

DRAW-BARS AND BUFFERS.

MR. ADAMS, from the committee on this subject, presented the following

REPORT.

To the Master Car-Builders' Association:

GENTLEMEN: Your Committee on Draw-Bars and Buffers beg leave to report, that during the past year they have given considerable attention to the subject, and find that the experience and opinions of master car-builders, so far as they have been communicated to us, vary very much in regard to the best combination or arrangement of draw-bars and buffers; also, as to whether cast or wrought iron is best adapted as a material for the former. In regard to this, however, it is generally admitted that the individual experience of such car-builders has been chiefly confined either to the one material or the other, and their opinions are inclined to favor what they have been using. Your committee can not, of course, give much weight

to opinions that are not based upon ascertained facts derived from careful comparison and observation. We have a statement from the Lake Shore and Michigan Southern road, upon which both cast and wrought draw-bars are used in large numbers, and the preference is given to cast iron as being about fifty per cent cheaper than wrought. Mr. Garey, of the New-York and Harlem road, although he does not claim to have tried cast iron to any very great extent, gives his opinion that wrought iron is from thirty to fifty per cent cheaper than cast.

Your committee is satisfied that a great advantage would be derived from a uniform draw-bar such as would be accepted as a standard, and which should also be a self-coupler; but we are not prepared to say that any has yet been invented that is worthy of such acceptance. There is probably no special feature of car construction in regard to which there is greater diversity of opinion and practice, and we have therefore come to the conclusion to recommend at present no definite action by this Association, unless it may be considered expedient to invite whoever may have any arrangement or plan for coupling cars, to send models or drawings of the same to the rooms of the Association, in New-York, where they can be compared and inspected, and perhaps some conclusion formed as to which is the best to meet the wants of railroad companies.

With respect to the number of accidents which may be attributed to a lack of uniformity in freight draw-bars, your committee can give no reliable estimate; yet it is evident to us and to all railroad men, that such accidents are very numerous, embracing a large number of railroad employees, who are either killed or crippled for life. It can not be doubted that a large proportion of these casualties may be traced to the difference in the style and construction of draw-bars and of buffer-blocks and dead-woods. Your committee would therefore recommend that the Association consider the subject carefully, with a view to some action calculated to diminish the evil complained of. We submit herewith a drawing illustrating what your committee deems the best attachment for the rear or back end of the draw-bar now in use, being more secure and less expensive than the present method.

F. D. Adams, C. A. Smith, } *Committee.*

Mr. F. D. Adams called attention to the very great difference of opinion, as shown in the replies to the circulars, relative to the comparative cost of wrought and cast-iron draw-bars, the extreme estimates differing about one hundred per cent.

Mr. E. Varney said that on his road the old wrought bars had been replaced by those of cast-iron. The former were continually breaking, while the latter were much more serviceable, and did not cost more than one third as much as wrought-iron ones. He used the old-fashioned buffers. They were called "man-killers" by some, but this was hardly true, so far as his experience enabled him to judge.

Mr. M. P. Ford was opposed to leaving off buffers, as they were a great protection to those who coupled cars, and saved a great many lives.

Mr. V. D. Perry said that his road had equipped about forty cars with wrought-iron draw-bars, and all of them had been broken and thrown away. Cast-iron ones were better and more economical. He had used buffers, allowing 16 inches between cars, for twenty years, and still continued to use them. They were entirely satisfactory.

Mr. F. D. Adams considered the old-fashioned buffers or dead-woods to be regular man-killers. He was not opposed to the use of wood buffers, but only to the way in which they were put on. They should always be of sufficient thickness to prevent the cars from coming into such close contact as to endanger the lives of the men who did the coupling.

Mr. Ambrose Ward said that light buffer blocks would not do for heavy trains; they would break the end-sills.

Mr. L. Garey urged the importance of a combination of draw-bar and buffer to be attached to the car-body itself. For heavy freight trains there was no certain method of attachment. There must be a revolution in the present manner of connecting cars. We must have a continuous draw-bar from the locomotive through the whole train. If such a method could be devised, it would lessen the cost of repairs from 65 to 70 per cent.

Mr. John Kirby was in favor of a drawing attachment to be located at the centre of the car, and that the draw-bar should be continuous. In order to bring about something of this kind, he proposed that every member should give the matter his attention, and before the next annual meeting send drawings to the Association rooms in New-York, embodying his ideas. He regarded the buffer-blocks on each side of the draw-head as man-killers, or at least man-maimers. On his road they used 6-inch corner blocks, and although with this arrangement there was some expense for draw-springs, it was less than that for law-suits. He would spend money for draw-springs, and dispense with dead-woods or buffer-blocks.

Mr. W. R. Davenport urged the necessity of doing something to lessen the perils of car-coupling. Every life sacrificed in adhering to the use of the old-fashioned man-killers was constructive murder, because we compelled the poor fellows who went between the cars to do the coupling to look out for six dangers at the same time. They were not absent-minded, but had too many things to attend to at the critical moment. He had given this subject his attention for twenty years. The road he was formerly connected with had abandoned the man-killers, and now there were not so many men to be seen going about the country with the Lake Shore *mark* upon them—a missing or mutilated hand or arm. The dead-wood blocks were insufficient to withstand the enormous force of concussion. There must be some kind of a cushion in the shape of a buffer spring.

Mr. L. Garey was as much surprised to hear that any road used the so-called "man-killers" of twenty years ago, as he would be to hear that any road used cross-timber floor-framing instead of longitudinal.

[The discussion was continued for a considerable time, in the course of which a number of gentlemen participated; but owing to the general low tone of the speakers, much of what was said was inaudible or indistinctly heard by the reporter, who can do no justice to the discussion by reporting mere fragmentary and disconnected sentences upon topics involving the use of mechanical terms of which he does not expect to have a perfectly clear understanding until after the completion of the "Dictionary."]

At the close of the discussion, Mr. L. Garey was added to the committee in place of Mr. Joseph Jones, and the committee continued for another year.

BEST DEVICE TO PREVENT ACCIDENTS IN COUPLING CARS.

Mr. F. Childs, from the committee on the subject, presented and read the following

REPORT.

To the Master Car-Builders' Association:

Gentlemen: Your committee, appointed at the last Annual Convention to inquire into the "best device to prevent accidents while coupling cars," beg leave to report, that the following questions were issued in the form of a circular, and distributed amongst all our members; and we feel that the apparent want of interest in a matter in which all are more or less concerned, as shown by the replies received, and the very meagre information to be gleaned therefrom, is not at all likely to elevate our standing as an association in the eyes of the chief officers of our respective roads.

Question 1. About how many companies, other than your own, run cars over your road?

While some of the smaller roads have only one or two others beside their own, we find the principal roads run from 30 to 60, and in one case we have a return of 289 different companies' cars being run over one road.

Q. 2. How many different styles of draw-bars?

It is claimed that each build of car has, in nearly every case, a different style of draw bar, and many of the same class different modes of attaching to body of car.

Q. 3. What has been your experience as to height of draw-bars, both as to loss of life and damage to rolling stock, in consequence of draw-heads overlapping?

The general opinion, as expressed in the replies received, is to the effect that the variations in height of draw-bars is one of the most fruitful sources of accidents, not only to persons engaged in coupling cars, but also results in great damage to rolling stock.

Q. 4. Do you keep yours to M. C. B. standard of 2 ft. 9 in. from top of rail to centre of draw-head?

Out of twenty-three answers received, ten say that they do not keep their draw-heads to the M. C. B. standard height, some having them higher, and others nearer the rail.

Q. 5. How many accidents have been caused by violent switching during the past year?

Q. 6. How many have been injured where there was fair switching?

Q. 7. Number injured by getting their feet caught in wing-rail or frog, thrown down, and run over?

The answers received do not amount to any thing, and from the style of replies, we are led to believe that the sense of the questions was not fully understood, or at least the end to which the questions were put could not have been. Our object in putting these questions was to show the members of this Association that in nearly all cases of accident where the result has been really serious, there was something apart from the construction of the cars to which the cause was attributable; and as there are several devices which do away with the necessity for the person coupling going between the cars, we are inclined to regard the same favorably, at least until such time as a more perfect freight-car self-coupler may be brought before the public than we have seen as yet.

Q. 8. What kind of dead-wood would you recommend as being most likely to prevent injury, in case of draw-bar breaking or overlapping?

From the replies received, we gather that a solid dead-wood, 24 or 26 inches long by about 6 inches thick, placed immediately over the draw-head and in a line with sills of car, is the one generally regarded as being the best to meet all requirements.

Q. 9. Do you think uniformity of draw-bars would be conducive to safety?

All agree in saying yes, and we feel that such being the case, it is rather strange that there should be so many different styles of draw-bars, as also so much variation in height as shown by the replies to Question 3, nearly one half of those who answered the circular admitting that they do not keep their draw-bars to the M. C. B. standard. This is much to be regretted, and, so long as persisted in, we do not think that any self-coupling draw-bar can have the benefit of a fair and impartial trial.

Q. 10. Have you given any of the self-coupling draw-bars a trial? If so, whose?

Q. 11. What was your experience with them generally, and did you find that their use lessened the number of accidents?

From the replies elicited, we find that many of our leading roads have given quite a number of self-couplers a trial; but judging from their remarks as to how they answered the purpose for which they were intended, it would seem that they have generally failed. The greatest trouble seems to be that those anywhere approaching perfection are far too complicated and expensive, not only in the first cost, but also for repairs necessary to keep them in good working order.

Q. 12. What description of springs have you in use? If more than one kind, state your experience with each as far as relates to the subject in hand?

Of the different kinds of draft-springs in use, the "Hebbard" comes first, next the Volute and Coil, and last, the rubber. While we would not recommend any particular spring, still we are of opinion that they should be uniform in dimensions, and especially in the exhaust; this latter would give those whose business requires them to go between the cars much more confidence than at present, where the variation in the exhaust is so great.

Q. 13. Please give us your ideas on any other points you consider worthy of note, not mentioned above.

All replies received indorse the idea that a uniform coupler and attachment would be the means of curtailing the expenditure for breakages, as also the delays often arising from having to specially prepare material with which to repair any foreign cars which may happen to get broken while in transit over a connecting road.

After giving this whole matter serious thought and attention, your committee can see no other mode of accomplishing the object in view but by convening a special meeting, at which each road shall be represented by one delegate. To this end, we would recommend that the convention do instruct our secretary to issue circulars of invitation to the chief officers of railroad companies to send some one as their representative in whom they have full confidence, and whose decision they would accept and adopt as their standard, fully explaining that our object is to decide on a uniform draw-bar, with every thing necessary to make the hauling gear complete.

We would also invite attention to the very great difference at present existing in the size of coupling-pins and links, and would suggest that this matter also receive attention at the same time.

F. Childs,
Great Western Railway of Canada.

Mr. F. D. Adams thought the statements made in the report of the number of foreign cars passing over certain roads were unreliable, and had been made without sufficient knowledge. The number was altogether too small, as it seemed to him. There were nearly 300 different kinds of foreign cars running over the Boston and Albany road. This was known to a certainty by the system of mileage accounts in use by the company; and taking his own road as a criterion, he thought the numbers mentioned in the report far below the mark.

Mr. F. Childs explained that such might be the case. The statements were founded on the best data obtainable, and from the replies to circulars. In preparing the report he had been careful to recommend no particular kind of spring, or to indicate any partiality for any patented devices. When the Great Western road first started it used elliptics which exhausted at 6 or 7 inches. But one man was killed while these were used, but as soon as the road began to use springs of different capacities of exhaustion, they began to kill the men. The coupling attachments for cars were radically defective, and in order that some practical step might be taken in the direction of

reform, he would suggest that each railroad in the country should appoint a special delegate, and that these should meet together, and if possible devise some plan that would be an improvement upon present coupling attachments and be adopted by all roads. Something was wanted that would not only be effective but uniform.

MR. W. W. WILCOX favored the suggestion. In his judgment the gentleman from Canada had struck the right chord in this matter. In order to accomplish any thing we must have the support and encouragement of managers and superintendents. They must back us up, and he thought there was no better way of doing it than by appointing special delegates as proposed.

MR. F. D. ADAMS said it was important not only to have a good coupler, but that it should be adopted uniformly by all the roads. Suppose any particular road, the Boston and Albany for example, adopt one that is really the best; away go the cars on to other lines in all directions, and our brakemen get no benefit from the coupler, but are obliged to use those attached to foreign cars coming on our road, with all the risks attending them.

MR. L. GAREY said that the want of uniformity in the matter of couplings was very expensive to the companies, and managers were beginning to see it. Even if a coupling were not the best one, great expense would be saved by making it uniform; and he thought it would be advisable for the committee on this subject to prepare something in the form of a circular to be addressed to railroad officers, calling their special attention to this matter.

The report of the committee was then accepted, which involves the adoption of the recommendation contained in the report, that the Secretary of the Association be directed to issue a circular on the coupling of cars, to be addressed to railroad officers.

SUBJECTS FOR DISCUSSION AT THE NEXT ANNUAL MEETING.

MR. W. R. DAVENPORT, from the committee on the subject, submitted the following report:

To the Master Car-Builders' Association:

Your Committee on Subjects for Discussion for the next Annual Meeting beg leave to report that, as it is probable that some subjects will lie over until next year, we have thought best to submit but few subjects, and propose a new feature, namely, half an hour of each session to be devoted to receiving and answering questions from any member, which questions may be written on slips of paper, which will be collected and handed to the President, and by him be asked of the Convention and be answered by any member.

In compliance with requests of members, we propose the following subjects: Best style and most economical truck for freight-cars; also best position and hanging of brakes, and position of brake-staff, right or left hand, when on the car; best remedy for hot journals, and how to treat them; best metals for bearings, and best kind of lubricating oil and packing material; car-wheels, mileage of freight and passenger wheels; best methods of fitting; excessive wear of flanges, and cause; number of broken wheels, and cause; practicability of train-brakes on freight-trains.

The committee also submit some suggestions from J. B. Hough, M.D., Professor of Physics and Chemistry in Miami Valley Institute, and Professor of Chemistry and Toxicology in the Miami Medical College of Cincinnati, to remove the water-coolers of passenger-cars from the water-closets, in which they are frequently placed.

The reason for the suggestion is that the atmosphere of the closets is always more or less foul, and its noxious effluvia are quickly absorbed by the water, even if covered more closely than it generally is.

In behalf of the public it is respectfully and earnestly requested that the matter be taken into consideration without delay, as it is believed the present arrangement alluded to is materially at variance with several sanitary conditions.

MR. DAVENPORT explained that the new feature of devoting a special time to the receiving and answering questions, was designed to meet the case of quite a large number of experienced members of the Association who came to every annual meeting full of information of value to their associates, but who, from their inherent modesty or want of practice in public speaking, sat through the sessions day after day with their mouths shut, and went home with their ideas upon many important matters bottled up. Their questions were never asked nor answered. They went away with much valuable knowledge, which, were it not for their diffidence, might have been transmitted to the Association.

The report was accepted.

TRAIN-BRAKES.

MR. R. S. RAMSEY, Pennsylvania R.R., presented a lengthy report from the Committee on Brakes, embodying the replies to the circulars sent out by the committee. The report states the general requisites of a perfect brake, and the importance of having a uniform kind, but does not recommend any particular brake now in use. It is too voluminous to be inserted here, but will appear in its place in the official report of the proceedings.

MR. L. GAREY thought that in a few years from now no train would be permitted to run on our railroads without an effective power-brake. In regard to the various kinds now in use, the Westinghouse had been longest before the public and is used on a large number of roads. It was in many respects a very serviceable brake, but was still susceptible of improvement. We want the best we can get, and should be ready to adopt every improvement that may be discovered, without regard to special interests, or the source from which they originate.

MR. A. STEINBACH, Philadelphia and Reading, said that both the Westinghouse and Vacuum brakes had been in use on his road for some time. Both had been tested, and from the experience of the road with them, the Vacuum had proved to be considerably less expensive. It had given the road no trouble, or at least not five per cent as much as the Westinghouse had. The great difficulty with the latter brake was in starting from stations.

MR. F. D. ADAMS, Boston and Albany, said that his road used both, and they were giving very good satisfaction. His road officers were rather inclined to favor the Vacuum, although there was one objection to it on account of the unearthly screech attending its operation, and which annoyed people along the line. This, however, could doubtless be remedied. The Westinghouse was good and reliable, not quite as sure as the Vacuum, and rather more liable to get out of order. It was an expensive apparatus to take care of. His road was not putting on any of them now, but was putting on the Vacuum brakes altogether.

MR. V. D. PERRY, Hartford, Providence, and Fishkill, said that the Vacuum had been in use on his road for fifteen months on passenger and baggage-cars. For the first few months, inquiries were made as to its working, and the reports were favorable. The cost attending it was very little, the engineers liked it, and it had not been known to fail in a single instance.

MR. F. CHILDS said the Great Western of Canada had adopted the Westinghouse as a standard, and found it very useful.

MR. S. GRIFFITH, Indianapolis, Cincinnati, and Lafayette, said that all the cars on his road had been equipped with the Westinghouse for the last two years. The only trouble experienced was with the pump. With this exception the brake was never out of order. The Vacuum had been used on four coaches and baggage-cars for a few months past. Have had no trouble with it, and all were much pleased with its working.

MR. E. VARNEY, Fitchburg R.R., had used the Westinghouse for two years, was satisfied with it as a general thing, although the engineers growled some, and there had been some trouble with the connecting hose.

On motion, the Committee on Brakes was discharged from further service.

NEW COMMITTEE ON BRAKES.

A new Committee on Brakes was ordered, and the Chair thereupon appointed Messrs. R. S. Ramsey, of the Pennsylvania R.R.; George Hackett, of the Central R.R. of New-Jersey; and G. W. Demarest, of the Northern Central R.R.

The Committee on Appliances for Replacing Cars on Track was called on for a report, when it was stated in behalf of the chairman, who was absent, that he was not ready to report and requested more time which was granted.

CAR-ROOFS.

MR. F. D. ADAMS requested permission to read a communication on the subject of car-roofs. He had examined the model representing the roof referred to in the paper proposed to be read, and he thought it was entitled to some consideration. It was called the "standard roof." Why this particular name was given to it he didn't know, unless it was suggested by the standard axle.

Mr. M. P. FORD objected to the reading, and inquired if the communication was from an outside party whose object was to introduce his particular invention to the notice of the Association. If so, he objected to such a proceeding as an infraction of the rules, and as establishing a precedent which would compel us to do the same thing in other like cases.

MR. F. D. ADAMS said the communication was from an outside party, and he had proposed to read it because he thought the subject-matter of it would be valuable in connection with the report of the committee on car-roofs made yesterday. He thought if the Association was a progressive one, and wanted to find out the best plans and methods, some notice must, in the nature of the case, be taken of outside parties. The roof to which the paper referred was a new one, or at least he had never heard of it before.

MR. M. P. FORD referred to the clause of the constitution prohibiting any patentees or their agents from advocating their claims in the Convention. We could not undertake to discriminate between good and bad patents.

Mr. F. D. ADAMS said he was no agent of any patentee. He had no interest whatever in this roof, and was an entire stranger to the inventors of it. He had no desire to advocate its claims, but considering it a matter of some interest, he had merely asked permission to read the paper. He had presented the matter fairly, and it was for the Convention to grant or refuse such permission.

The question was then taken, and permission to read the paper was refused by a decided vote.

INVITATIONS.

A communication was received from the President of the Cincinnati Board of Trade, tendering to the members of the Convention the free use of their rooms during the stay of the members in the city.

A communication was also received from the Young Men's Mercantile Library Association of Cincinnati, tendering the use of their rooms and works of reference to the members of the Convention during their stay in the city.

AMENDMENT TO CONSTITUTION.

MR. G. W. DEMAREST, Northern Railroad, moved that Art. VII., Sec. 2 of the Constitution of the Association be amended by adding thereto the following: and from 8 o'clock P.M. to 10 o'clock P.M.

Mr. F. D. ADAMS hoped the amendment would not be adopted. He knew from former experience that any attempt to hold evening sessions would be a failure. Such an amendment would be a dead letter. It had already been tried. Members would not attend in the evening, but would go off to the theatres or somewhere else. It was nonsense to adopt the proposed amendment.

Mr. W. R. DAVENPORT said we always enjoyed a frolic the best after our work was done. Then, if ever, was the time for fun. We had been most hospitably and generously entertained at Cincinnati, Boston, and elsewhere; but we came to these our annual meetings for business. As soon as we got fairly organized, however, a gush of invitations poured in upon us and were accepted. There were evil-eyed, invidious fellows, who were ready to go whispering around that we merely came here to have a good time. He proposed that we should have two sessions a day for the first two days, and but one on the third day, and then, after closing up our work, take our recreation—take it when our business is through with, and not mingle it with the business.

MR. L. GAREY thought it was folly to undertake to prescribe rules for future meetings. Let each meeting determine whether they will have one or more sessions a day, or whether they will accept this, that, or the other invitation.

MR. DEMAREST thought the present article of the constitution prescribed a rule for future meetings as much as the proposed amendment.

MR. JOHN KIRBY said he didn't think it was exactly the right thing to travel 500 or a 1000 miles to transact business, and then devote so much time to pleasure. A man that can't stand two sessions a day while the Convention is together is not much of a business man.

MR. DAVENPORT said that some definite action should be taken now, otherwise, in anticipation of the next meeting, steamboats would be chartered, carriages hired, and bands of music engaged. We should give notice beforehand that, when we come together, it is business first and pleasure afterwards.

After some further conversation the question was taken, and the motion was lost.

OFFICERS FOR ENSUING YEAR.

MR. J. L. HACKATHORN, from the committee appointed to present the names of officers of the Association to be chosen for the ensuing year, made a report as follows:

For President, LEANDER GAREY.
" Vice-President, H. O. WADLIE.
" Secretary, C. A. SMITH.
" Treasurer, A. STEINBACH.

These gentlemen were thereupon duly elected by ballot for the respective offices named.

SUNDRY COMMITTEES.

The Chair announced the following committees:

On Car-wheels; Best Method of Fitting; Flange Wear and Causes; Mileage and Breakage.—Messrs. H. O. Wadlie, Illinois Central; and John Kirby, Lake Shore and Michigan Southern.

On Best Remedy for Hot Journals; Their Treatment; Best Metal for Bearings; Best Lubricating

Oils and Packing Material.—Messrs. J. W. Holmes, Atlantic and Great Western; J. D. McIlwain, Lake Shore and Tuscarawas Valley; and H. Steinbrunner, Cleveland and Pittsburg.

On Best Style and Most Economical Truck for Freight-Cars; Best Position and Hanging of Brakes and Position of Brake-Shaft (right and left hand), when Standing on the Car.—Messrs. D. Hoit, New-York Central and Hudson River; John Kirby, Lake Shore and Michigan Southern; and W. F. Smith, Cleveland, Columbus, Cincinnati, and Indianapolis.

On the Size and Framing of Freight and Passenger Cars.—Messrs. C. A. Smith, late of Erie Railway; E. A. Olmstead, New-York Central and Hudson River; and H. A. Webster, New-Jersey Southern.

On Arrangements for Next Annual Meeting.—Messrs. C. A. Smith, late of Erie Railway, and Willis Davis, Empire Transportation Company.

THE NEXT PLACE OF MEETING.

Mr. J. W. Holmes, from the committee appointed to recommend a suitable place for the next annual meeting of the Association, made a report recommending the city of New-York as such place. The report was agreed to.

Mr. Holmes moved that the committee on the size and framing of freight and passenger-cars be discharged from further service, which motion was agreed to.

THANKS.

Mr. J. W. Holmes, from the Committee on Communications, made a report tendering the thanks of the Association to the Executive Committee and the citizens of Cincinnati who have so cordially received and entertained the members and friends of the Association; to the Committee of Arrangements, for the provision made for the comfort of the members in attendance; to the Young Men's Mercantile Library Association, and the Cincinnati Board of Trade, for the offer of the use of their respective rooms, books, papers, etc.; to Messrs. Post & Co., for their kind invitation to inspect their works; to Jonah Woodruff, Esq., for his invitation to inspect his elegant palace and sleeping-car; to Messrs. Gest & Atkinson, for invitation to visit their oil-works; to R. N. Phelps, for his favorable report in regard to the working of the standard axle; to the proprietors of the Gibson House, for their hospitality and good attention, and to the Pullman Palace Car Company and railroad companies, for transportation facilities furnished to enable the members of the Association to attend this convention.

Report agreed to.

LARGE AND SMALL JOURNALS.

Mr. F. Childs called the attention of the Convention to two journals which he had brought with him, and which had been broken in regular service on the Great Western Railway. They were 7 inches long by 3½ in diameter, and the fractures had taken place at the fillet or inside end of the journals, and presented the same appearance in each. They were caused apparently by a disproportion of length and diameter, the latter being insufficient for the former, and producing an undue amount of leverage. The surfaces of the fractures were quite smooth near the circumference, but rough and uneven in the central parts of the iron, indicating that the breaking had been gradual, and was produced by excessive strain. This, in the opinion of Mr. Childs, was an evidence in favor of a larger proportional diameter for journals of this length, and proved the wisdom of the size of journals adopted last year for the standard axle.

Mr. F. D. Adams remarked upon the satisfactory results of the adoption of the standard axle, so far as it had been tried, and instanced the Boston and Albany road, which had many passenger-cars equipped with it. They worked admirably. He was aware there was much opposition to them in various quarters, as was apparent from sundry articles which had appeared in the Car-Builder within the past year. The first cost was something more than the smaller axles; but this was quite an insignificant matter when compared with the many advantages secured—a saving of fifty per cent in brasses, seventy-five per cent in oil, and diminished draught power. This latter saving had been demonstrated by careful experiment. And with respect to freight-cars with various tonnage capacity, he had found that the greater the tonnage, the greater the difference was in favor of the axle. The question of friction it was needless to discuss, as the principle was pretty well established that friction was not increased by an increase of journal surface.

The Convention then adjourned.

A number of contributed and illustrated articles have been crowded out of our present issue, to make room for the Proceedings of the Convention. They will appear in our next number.

Small Journals vs. Large Journals.

To the Editor of the National Car-Builder:

Dear Sir: On looking over the articles that have appeared in your columns during the past year, in reference to the friction of journals, it appears to me that erroneous views have crept into the discussion through a misunderstanding of the fundamental principle upon which some of the arguments have been based. To state the matter concisely, *force* has been confounded with *power*. Perhaps there are very few points on which mechanics mystify themselves more in mechanical discussions than by the want of a clear understanding of the difference between force and power.

It will be my aim in this communication to take the same data which have been assumed by others in this discussion; but to derive from these data conclusions exactly opposite to those which others have deduced from them.

Suppose a cube of brass, weighing 100 pounds, at rest upon a slab of iron. Gravity is constantly acting upon this mass of brass, and 100 pounds represents the *force* with which gravity draws the brass down. But although this *force* is constantly acting, it produces no *power*, no mechanical effect. Force must be combined with motion to produce power. If we raise the brass one foot, no matter whether we raise it slowly or rapidly, we must expend the same amount of *power*—that is, 100 foot-pounds (which is equivalent to one pound raised 100 feet, or 10 pounds raised 10 feet, or 100 pounds raised one foot). In this case gravity is a resisting *force*, and to overcome it over a space of one foot in a *vertical* direction has required an expenditure of 100 foot-pounds of power. The measure of the power is the force multiplied by the space over which it has acted.

Next, suppose our slab of iron perfectly level, and the faces in contact of brass and iron, polished and so lubricated that the friction of the brass upon the iron shall be represented by a coefficient of eight per cent. What does this mean? That whatever *force* it may require to lift the brass vertically, it will require eight per cent of that force to slide it horizontally. In this case, friction as a resisting *force* is measured by eight pounds.

We are now prepared to receive and understand the mechanical principle, deduced from experiment, and recognized by all physicists, that within the proper limits, friction is independent of the area of the surfaces in contact or of their velocity of motion. That is, whether the brass retains its cubical form or is flattened out till its original surface of contact is increased four-fold, whether it is moved one foot per second or ten feet per second, the action of friction upon it as a resisting *force* is unchanged. Shall we argue from this that it will require no more expenditure of *power* per second to move this brass at the rate of ten feet per second than one foot per second? By no means. Our mechanical principle, which we adopt as a rule, does not state this. It merely states that the resisting *force* is a constant, not a variable one. To arrive at the power consumed in overcoming that force, we must multiply the force by the space over which it acts. If the velocity is one foot per second, then the *power* required to overcome the resisting *force* of friction is eight foot-pounds per second. If the velocity is ten feet per second, then the *power* consumed in overcoming the resisting *force* of friction is eighty foot-pounds per second. Thus it will be seen that as the velocity per second increases, the *power* consumed per second increases in the same ratio. But when we double the velocity, and with it the *power* consumed per second, we only require half as many seconds to traverse a given space. Hence the *power* consumed in overcoming the resisting *force* of friction over a given space is independent of velocity; for the single velocity multiplied by the full time, or the doubled velocity multiplied by the halved time, or the quadrupled velocity multiplied by the quartered time, all produce the same constant product of space passed over. This constant product of space, multiplied by the constant resisting *force* of friction, produces the same result of foot-pounds of *power* consumed. We may therefore enunciate another rule. While the resisting *force* exerted by friction, is independent of the surfaces in contact, and of their velocities, the *power* consumed per second in overcoming this *force* is equal to the product of that constant *force* multiplied by the space that the surfaces in contact travel over per second.

We now pass from the friction between horizontal surfaces to the friction between journals and their bearings. Place two pairs of trucks, with 33-inch wheels, on two pairs of level rails, all made exactly alike, except that in the one truck the axles are four inches in diameter their entire length, and in the other truck they are three inches in diameter their entire length. Let the brasses and lubricants be as nearly alike as possible. Wind a cord around the forward axle of each truck, so as to pull each truck straight forward on its track. Pass these cords over pulleys level with the top of each pair of axles, and attach weights to the lower ends of these cords. The axles being of the same diameter where the cord is wound round them as at the journals, it is evident that for every foot that each journal and brass rub by each other, the corresponding weight will descend one foot. Start both trucks at the same velocity, no matter what that velocity is, and vary the weights until they are just sufficient to maintain this velocity. When we have arrived at this point, we shall find that both weights will be the same, for the resisting *force* of friction, we have previously seen, is independent of the area of the surfaces in contact, and of their velocities. There is no question of *leverages* here, for the resisting *force* of friction and the active force of the weight have both precisely the same leverage, or half the diameter of the axle.

As before, let eight per cent represent the coefficient of friction between the brass and the journal, and let 100 pounds represent the load on the brasses of each truck—these numbers will illustrate the principle involved as well as larger ones. The weights attached to the cords will then be eight pounds each, and this eight pounds represents the resisting *force* of friction, which is the same in both trucks. The circumferences of the journals will be 0·79 ft. and 1·05 ft., and of the wheels, 8·65 ft. It is necessary to express these in feet, as our unit of measuring power is expressed in *foot*-pounds. After the wheels have made ten complete revolutions, the trucks will have moved forward 86·5 ft.; the weight attached to the four-inch journal will have descended 10·5 feet, and the weight attached to the three-inch journal will have descended 7·9 ft. The *power* required to overcome the resisting *force* of friction will be, in each case, this constant *force* multiplied by the space it has passed over. In case of the four-inch journal, it will be 8 pounds × 10·5 feet = 84 foot-pounds. For the three-inch journal it will be 8 pounds × 7·9 feet = 63·2 foot-pounds. Hence, to overcome the resisting *force* of friction required to move both trucks forward 86·5 feet has necessitated an expenditure of 20·8 foot-pounds more *power* for the four-inch journal than for the three-inch journal. It has been already shown that the *power* required to overcome the resisting *force* of friction through a given space, is independent of velocities in case of friction of plane surfaces; and precisely the same reasoning can be applied to the friction of journals.

From what has been stated we may plainly deduce the following conclusions:

First, that friction, or, to be more precise, the resisting *force* of friction, is independent of the surfaces in contact, or of the velocities at which they move over each other.

Second, that in moving cars a given number of miles, the *power* required to overcome the resisting *force* of friction varies directly as the diameter of the journals, but is independent of the length of the journals.

Third, that the power consumed in moving cars a given number of miles by the resisting *force* of fric-

tion between journals and their bearings, is entirely independent of the velocity at which they are moved.

What is here stated in reference to cars applies solely to those resistances arising from the friction of journals, and then only within such limits as shall not affect the conditions under which the surfaces in contact are supposed to act. When cars are moved at high velocities, many other resistances are met with than those arising from the friction of journals. Some of these resistances increase the consumption of *power* at a ratio far greater than the simple acceleration of velocity.

In investigating the friction of journals, it must be borne in mind that the surfaces in contact may be made so small, that the weight per square inch may actually drive out the thin film of lubricant which is supposed to be there; or the velocity may be so great as that the friction causes a heating of the surfaces in contact, and partial destruction of the lubricant; or the journal may be so small in diameter as to spring out of line under the weight it carries. These and other modifying influences might so change the conditions supposed to exist in any discussion, as to render the argument inapplicable to the varied position which the case would thus assume.

But as my discussion here is not exhaustive, and has only reference to a single class of resistances acting within such limits as shall not vary the principle of their action, I omit any further allusion to those cases that are not under our present consideration.

GERMEN.

JEFFERSONVILLE, IND., June, 1874.

The Master Car-Builders' Convention.

THE attendance last month at Cincinnati, upon the eighth annual meeting of the Association, was not quite equal to that of last year at Boston; but under the circumstances, was as large as could have been expected, in view of the long-continued depression in railroad business. The roads represented were mainly those of the North and West. The usual amount of business was transacted, and a number of new members joined the Association.

We expected to be able to publish in our present issue as full a report of the discussions as we did last year, but are unable to do so, owing to the failure of a short-hand reporter to keep an engagement made by him with the Committee of Arrangements. The services of another were procured for the greater part of the second day's session, which enables us to give in full the discussion on check-chains, and a portion of what was said on ventilation—the remainder of the discussions, as they appear in the proceedings, being a condensed summary of what was actually said, and not a verbatim report.

Unlike the meeting of last year, the attention of the members was not so much absorbed with one particular subject. The reports of committees were longer and more numerous than heretofore, and a good deal of time was occupied in the reading of them. Some of the shorter ones will be found in their regular place in the proceedings, and also portions of the longer ones. Those on brakes, and the size and framing of freight and passenger-cars, we are obliged to leave out on account of their length. The greater labor bestowed upon reports is one of the marked features of this year's meeting. Hitherto, a full and elaborate report, giving the results of prolonged and careful investigation of any special topic, has been the exception instead of the rule. Very frequently, none have been in readiness when called for, or they have been so hastily prepared, or so meagre in the information embodied, as to amount to little more than a very lame apology. We are glad to see more work done by committees. This kind of work constitutes the life of the Association, and the basis of whatever is done of any practical value at its yearly meetings. There is still room, however, for more improvement in this respect. To merely present in detail the replies to the various questions contained in the circulars sent out, is not in any proper sense a report, but rather the material out of which a report should be made. As we look at it, it is the duty of committees to work up this material, analyze it, and give such a statement of results and conclusions as will enable hearers or readers to comprehend what it all amounts to, without going over the details themselves. If we wanted a house built, we should expect the contractor to do something more than merely deliver a quantity of bricks, nails, glass, and lumber. We should want him to arrange his materials in such a way as to serve the purposes of a habitation.

One of the most valuable and carefully prepared reports made to the convention is the one on ventilation, a part of which will be found in its proper place. The difficulties of the problem are fully comprehended and set forth; and in order to deal with them intelligently, the committee has sought the aid of the best scientific authorities to determine what ventilation is, why it is necessary, and what is required to properly ventilate our passenger-cars. The report on train-brakes will be found as full and interesting as the one made by the same committee last year. The committee assumes that perfection in brakes has not yet been reached, notices the various kinds now in use, summarizes the information obtained and progress made during the past year, and states the requisites of such a brake as is wanted to fully meet the demands and secure the safety of the public. The report carefully avoids indorsing any particular appliance, and consequently the discussion which followed was brief and devoid of excitement. The report upon truck and car-body check-chains elicited a lengthy and somewhat animated debate, which the reader will find fully reported. The report upon draw-bars and buffers also gave rise to considerable discussion, as well as difference of opinion as to the merits of the various devices now in use to prevent accidents in coupling cars. The prevailing impression seemed to be that the car attachments now in use should be superseded by something entirely new, safer, and more effective. No particular plan, however, was recommended, and the committee was continued another year. In this connection, we would refer the reader to the report of Mr. Childs on the best means of preventing accidents while coupling cars, in which the aid of the higher railway officers is solicited in devising a uniform plan to remedy present evils.

The report on car-roofs will also be found in the published proceedings. The reading of it raised a little flurry touching the propriety of committees recommending, or favorably alluding to, patented devices in their reports. It was argued that as almost every kind of improved device pertaining to railway operation was patented nowadays, it would be difficult for the Association to make progress without some recognition of the merits of such devices. No definite action, however, was taken upon the point, and the report was accepted.

Mr. W. E. Partridge, who has for several months been engaged upon the Dictionary of Terms, made a statement setting forth the character and progress of the work, and the causes which operated to delay its completion. Proof-pages were also exhibited, showing the style of the work, and the progress already made; and after considerable discussion, which placed in a clearer light the difficulties incident to such an undertaking, the committee was allowed such time as was necessary for completing it, without special limitation. Knowing as we do something of the labor and time required to make the work what it should be, another year will not be too long to wait, especially as no such work, nor any thing resembling it, has ever yet been compiled.

The meeting was, on the whole, as successful as any of its predecessors. A merely geographical centre is not always the most likely to secure a large attendance. As a rule, we think a greater number of Western members will attend a convention in any one of the sea-board cities than in Chicago, St. Louis, or Cincinnati, inasmuch as a trip to the former involves more of recreation and enjoyment; consequently the proposition to hold the next annual meeting in New-York received an almost unanimous approval.

The entertainments provided for the members of the convention were creditable to the enterprise and hospitality of the merchants and manufacturers of the Queen City, and were thoroughly enjoyed by the recipients. They consisted of a visit to Robinson's Opera House, a ride through the suburbs, a balcony serenade at the Gibson House, and a steamboat excursion on the Ohio River. The Executive Committee, under whose direction the entertainments were provided, consisted of P. P. Lane, of Lane & Bodley; G. W. P. Atkinson, of Gest & Atkinson; C. H. L'Hommedieu, of Post & Company; John H. Walker of American Bolt and Nut Works; and George Kinsey, of Union Car-Spring Co.

MR. ASA WHITNEY, the head of the firm of Whitney & Sons, Philadelphia, manufacturers of car-wheels, and one of the oldest and ablest of American manufacturers of railroad material, died in Philadelphia, June 4th, in his 83d year.

IT is said that arrangements are being made by the Pennsylvania Railroad Company by which two trains on the road will make but two stops between Philadelphia and Pittsburg, and run at a speed of forty-five miles an hour. Water-troughs are being placed at proper intervals, so the tanks can be supplied without stopping the trains.

MR. GEORGE W. CUSHING, superintendent of machinery of the Toledo, Wabash and Western Railway, having resigned, the machinery department will hereafter be in charge of the following gentlemen: James B. Morse, master mechanic Eastern Division, Fort Wayne, Ind.; Jacob Johann, master mechanic Western Division, Springfield, Ill.; U. H. Kohler, master car-builder, Toledo, O.

THE Port Jervis (N. Y.) *Gazette* of recent date says: "At the Erie car-shop in this place a record is kept of the wheels removed from cars. To-day, four wheels were removed from a freight-car, which were made, respectively, in the following years: December 24, 1853, two November 30th, 1853, May 31st, 1854. These wheels have been running over 20 years, have doubtless worn out several cars, and are fit still apparently for as much more wear. Allowing 20 days in each year for standing still, and ten miles an hour while running, they have run 1,697,400 miles."

THE forthcoming number of Poor's annual statement of the condition and earnings of all the railways in the United States will be issued in a few days. Instead of showing, as was commonly thought would be the case, a decrease of earnings for the year of 1873 as one of the results of the panic, it will show that the total earnings for 1873 were about $50,000,000 in excess of any previous year, the increase being mainly on Eastern roads, as, for instance: $10,000,000 in New York roads, $15,000,000 in Pennsylvania roads, $5,000,000 in New-Jersey roads, and $2,500,000 in New-England roads.

THE Pittsburg *American Manufacturer* says that the car-shops of the Alleghany Car and Transportation Company were completely destroyed by fire on June 11th. The buildings were three in number: machine-shop, 75x126 feet, two stories; blacksmith-shop, 50x112 feet; erecting-shop, 75x220 feet—all supplied with new machinery of the best description. A number of cars were consumed, but fortunately the machinery was not so badly damaged but that much of it can be repaired. The buildings cost about $20,000 and the machinery some $25,000, which were insured for $15,000. Workmen were employed in removing the *débris* before the ashes were cool, and the works will be rebuilt with the least possible delay, the company having large orders ahead.

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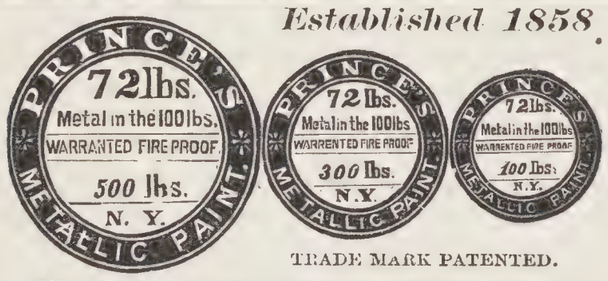

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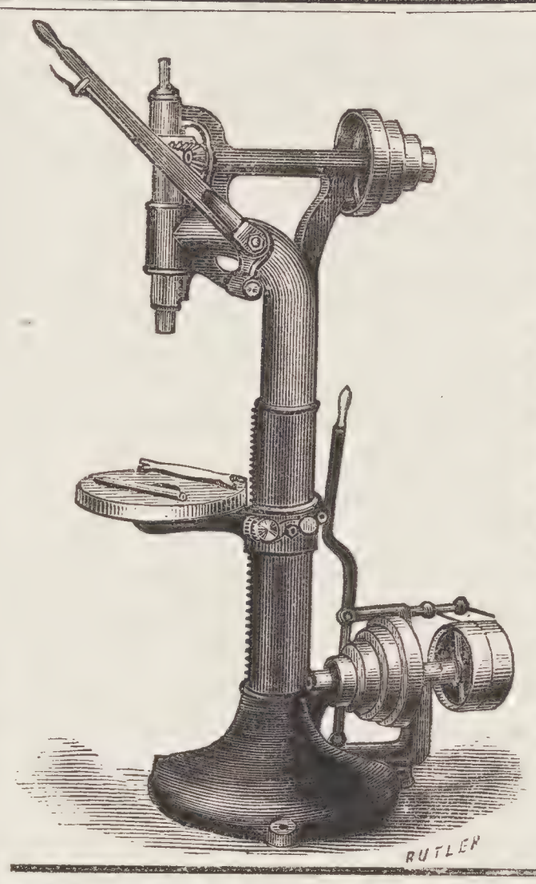

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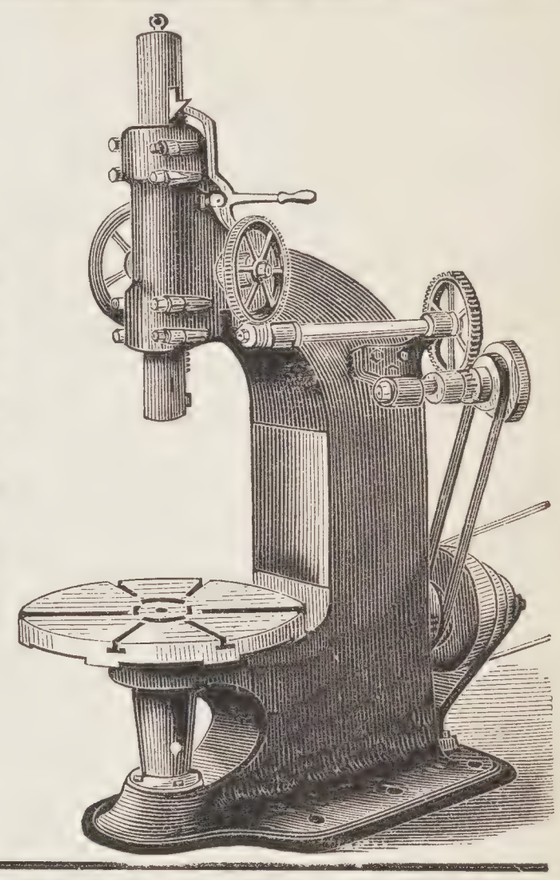

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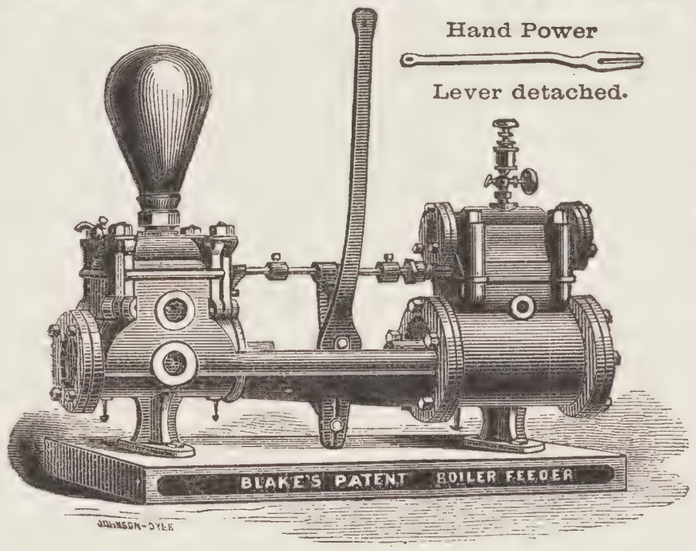

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GEO. W. BARKER, Esq., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872, I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your resquest herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

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Bass & Hanna..... ..... Fort Wayne, Ind.
Bailey, Howson & Co.....St. Paul, Minn.
Blanchard & Arnold.....Milwaukee, Wis.
Boston Car-Wheel Co.....Camb'gep't, Mass.
Bowler, Mayer & Brayton.....Cleveland, Ohio.
Chicago Car-Wheel Co.....Chicago, Ill.
Davenport, Fairbairn & Co..... .....Erie, Pa.
Dawson Manufacturing Co.....Dawson, Ga.
Detroit Car-Wheel Works..... .Detroit, Mich.
Fulton Foundry Co.....Cleveland, Ohio.
Gill, John L. Jr..... ..Allegheny City, Pa.
Green's Car-Wheel Manufacturing Co....St. Louis. Mo.
Hamtramck Car-Wheel Works.....Detroit, Mich.
Haskell & Barker Car Co .....Michigan City, Ind.
Harrisburg Car Manufacturing Co.....Harrisburg, Pa.
Heartt, Jonas S. & Co.....Troy, N. Y.
Jackson & Woodin.....Berwick, Pa.
John L. Gill..... .....Columbus, Ohio.
Lehigh Car-Wheel & Axle Works.....Catasauqua, Pa.
Lobdell Car-Wheel Works.....Wilmington, Del.
London Car-Wheel Co..... .....London, Can.
Louisville Car-Wheel & Railway Supply Co...Louisville, Ky.
Middlebrook & Mack..... .....Oswego, N. Y.
Missouri Car and Foundry Co.....St. Louis, Mo.
Mowry Car and Wheel Works..... .Cincinnati, Ohio.
Ohio Falls Car Co..... .....Jeffersonville, Ind.
Pettengill, Glass & Co.....Cleveland, Ohio.
Quealey, W. J..... ....Hannibal, Mo.
Ramapo Wheel & Foundry Co.....Ramapo, N. Y.
Russell, B. F. & Co .... Chicago, Ill.
Rutland Foundry & Machine Co.....Rutland, Vt.
Sterling Car-Wheel Foundry..... .Columbus, Ohio.
Scoville, J. & N. C.....Buffalo, N. Y.
St. Louis Car-Wheel Co. ....St. Louis, Mo.
Taylor Iron Works.....High Bridge, N. J.
Thompson, Duglas..... Bordentown, N. J.
Tredegar Company..... .....Richmond, Va.
Toronto Car-Wheel Co..... .....Toronto, Can.
Washburn, Hunts & Co.....Jersey City, N. J.
Washburn Car-Wheel Manufacturing Co.....Worcester, Mass.
Wason Manufacturing Co.....Springfield, Mass.
Whitney A. & Sons.....Philadelphia, Pa.
Woodbury & Company..... .....E. Cambr'ge, Mass.
Wyoming Valley Manufacturing Co..... ...Wilkesbarre, Pa.

Locomotive Builders.

Baldwin Locomotive Works .....Philadelphia, Pa.
Brooks Locomotive Works .....Dunkirk, N. Y.
Danforth & Cooke.....Paterson, N. J.
Dawson & Baily (light locomotives).....Connellsville, Pa.
Dickson Manufacturing Co..... .....Scranton, Pa.
Grant Locomotive Works.....Paterson, N. J.
Hinckley Locomotive Works.....Boston, Mass.
Manchester Locomotive Works.....Manchester, N. H.
Mason, William.....Taunton, Mass.
McKay Iron and Locomotive Works.....Jersey City, N. J.
Portland Company..... .....Portland, Me.
Porter, Bell & Co. (light locomotives)... ...Pittsburg, Pa.
Pittsburg Locomotive Works.....Pittsburg, Pa.
Rogers Locomotive Works.....Paterson, N. J.
Rhode Island Locomotive Works..... ....Providence, R. I.
Schenectady Locomotive Works.....Schenectady, N. Y.
Taunton Locomotive Works.....Taunton, Mass.

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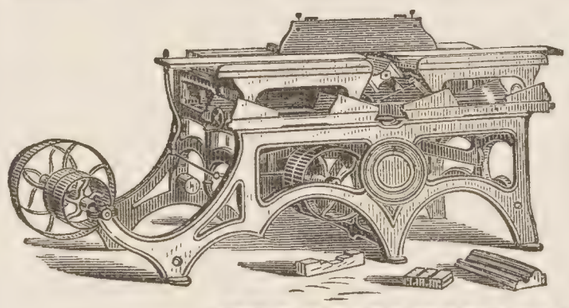

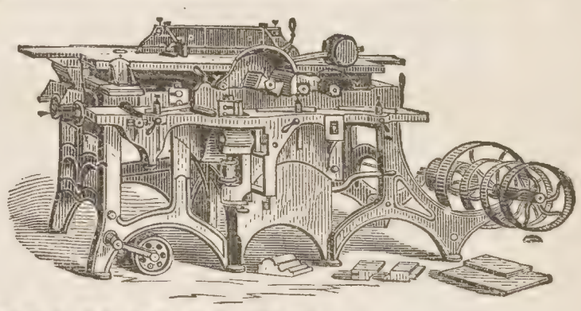

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Alabama Central	E. M. Smith	E. M. Smith	Selma, Ala.
Albany & Susquehanna	R. C. Blackall	R. C. Blackall	Albany. N. Y.
Alexandria & Fredericksburg			Alexandria, Va.
Alexandria, Nebraska & Iowa	Geo. Q. Adams		Alexandria, Mo.
Atchison, Topeka & Santa Fe	H. V. Farris		Topeka, Kans.
Atchison & Nebraska	Selah Williams		Atchison, Kan.
Alabama & Chattanooga	T. H. Kennedy		Chattanooga, Tenn.
Atlanta & West-Point	Wm. Rushton		Atlanta, Ga.
Atlanta & West Point		R. D. Cole	Newnan, Ga.
Atlantic & Gulf	C. E. Van Vorst	P. N. Raynal	Savannah, Ga.
Atlantic & North-Carolina	E. J. Clayton	E. J. Clayton	New-Berne, N. C.
Atlantic & Great Western		††J. H. F. Wiers	Meadville, Pa.
Atlantic & Great Western	William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Haggard	Cleveland, Ohio.
Atlantic & Great Western	‖J. B. Miller.	S. V. Smith	Kent, Ohio.
Atlantic & Great Western	Allen Cook	J. W. Holmes	Galion, Ohio.
Atlantic & Pacific	§§John Hewitt	E. Martin	St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South-Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
Allegheny Valley	G. W. Glass	R. Gunning	Pittsburg, Pa.
Adirondack	Jacob Myers	James J. Traver	Saratoga, N. Y.
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack.	Baltimore, Md.
Baltimore & Ohio		James H. Miller	Baltimore. Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott		Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
Central Ohio Division	Alex. Platt		Zanesville, Ohio.
S'dusky, Mans., & New'k Div.	Wm. Y. Johnson		Sandusky, Ohio.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Maine.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere Delaware	R. McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W.E.Chamberlain	Allston, Mass.
Boston, Barre & Gardner	John Lover		Worcester, Mass.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Blue Ridge			Anderson, S. C.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer	Jacob Williams	Oil City, Pa.
C			
Cairo & Vincennes	R. Williams.		Cairo, Ill.
California Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and branches	‡‡C. E. Benton	††C. E. Benton	St.Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis.	Catawissa, Pa
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach	Catasauqua, Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Charleston & Savannah	H. T. Calder		Charleston, S. C
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bossinger	Huntingdon, W.Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co.	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene. N. H.
Charlotte, Columbia & Augusta	Robert King	C. H. Frazer	Columbia, S. C.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac. Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Wiscon. Mad. & Mill. Divis			Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm Wilson	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan	W. H. Dunham,	Danville, Ill.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Divison	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen	W. H. H. Allison	Cincinnati. Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster. Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M.W. Dickerman.	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passumpsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	J. W. Sauerbach	Mt Savage, Md.
Central of Georgia	D. D. Arden	C. C. Millar.	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas.
Central R. R of Iowa	F. B. Woodruff	T. L. Seevers	Marshall, Iowa
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento. Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland, Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley	A. B. Seaman,	Saeramento, Cal.
Truckee Division	James Velsir	C. Lindsay	Truckee, Cal.
Humboldt Division	H. L. Stevenson	Chas. Thompson	Carlin, Nev.
Salt Lake Division	J. G. McCuen	Thos. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison	Cincinnati. Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa
Morris & Essex Division	W. H. Lewis	L S. Barber	Hoboken, N. J.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit. Mich.
Detroit. Lansing & Lake Michigan	Tho. G. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co	James Dickson	Thomas Orchard	Carbondale, Pa.
Rensselaer & Saratoga Div			Troy, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G.Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East-Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
Elizabethtown and Paducah	W. D. Robb	T. A. Cordrey	Elizabethtown, Ky.
Erie Railway	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna. Pa.
Erie Railway	‖V. Blackburn		Jersey City. N. J.
Erie Railway	‖F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E. Cooper	W. E. Cooper	Hornellsville, N. Y
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette		Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown. Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Jno. G. Coulon		Galveston, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	††Herbert Wallis	J. W. W. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Sol. Bills	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	††Wm. A. Robinson	F. Childs	Hamilton, Canada
Georgia	William Hardman	T. M. Preval	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland, Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H. L. Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J
Housatonic	C. R. Morris	J J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes.	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia. Ill.
North Division	J. B. Edams.		Amboy, Ill.
Iowa Division	Thomas W. Place		Waterloo. Iowa.
Iron	Perry Scott.	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. T. Sanford	R. B. More.	Mattoon. Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Keokuk & Des Moines Valley	Jas. Lamb	R. E. Smith	Keokuk, Iowa.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte. Kansas.
Arkansas Valley Div	**L. H Waugh.		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas.	Chester, S. C.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Leavenworth, Lawrence & Gal.	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith.	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley.			London, C. W.
Louisville, New-Albany & Chicago.	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island.	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington.	E. B. Gibbs	S. S. Pilson	Louisville, Ky.
Louisville & Nashville.	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville.	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville.	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division.	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div.	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern.	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division.	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp.	Adrian, Mich.
Toledo Division.	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division.	L. O. Gassett	J. Withyecombe.	Cleveland Ohio.
Buffalo Division.	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Lake Shore & Tuscarawas Valley.	Charles Fellows	J. D. McIlwain	Black River, Ohio.
Lake Ontario Shore.	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon.	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta.			Macon, Ga.
Maine Central.	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div.	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division.	John F. Merrill.		Waterville Me.
Macon & Western.	D. M. Gogul	James A. Knight.	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H
Marietta & Pittsburg.	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick.	M. Thornton.	M Thornton.	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley.	Chillicothe. Ohio
Memphis & Little Rock.	Tho. Rennells	P. Twitchell.	Argenta, Ark.
Memphis & Charleston.	A. Ross	A W. Drew	Memphis. Tenn.
Memphis & Charleston.	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay.	Mineral Point, Wis.
Mississippi & Tennessee.	Geo. Haszinger	J. Riny	Memphis, Tenn
Mississippi Central.	Henry Gibbon.	John E. Becton	Water Valley, Miss
Maryland & Delaware.	Samuel Peters.		Greensboro, Md.
Midland Pacific	A. C. Stiles.		Lincoln, Neb.
Milwaukee & Northern.		W. J. F. Liddell.	De Pere, Wis.
Milwaukee & St. Paul.		Wm. E. Kittredge.	Milwaukee, Wis.
Milwaukee & St. Paul.		John Baillie	Milwaukee, Wis.
Milwaukee & St. Paul.	J. Pettee	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division.	C. C. Clements.		Hastings, Minn.
Michigan Central.	‡A. P. Farrar		Jackson, Mich.
Michigan Central.		J. B. Sutherland.	Detroit, Mich.
Jackson, Lans'g & Saginaw Div.			Jackson Mich.
Mississippi Valley & Western.	J. S. Pickering.		Canton, Mo.
Montgomery & West-Point.	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula.	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard.	C. D. Wall		Girard, Ala.
Mobile & Ohio	B. S. Skates	John McHugh. I. T. Booth	Mobile, Ala. Whistler, Ala.
Morgan's Louisiana & Texas.	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf.	John S. McCrum		Kansas City, Mo.
Missouri River, Fort Scott & Gulf.		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas.	T. G. Gorman.		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend.	Sedalia, Mo.
Missouri, Kansas & Texas.	J. E. Wiggins.		Hannibal, Mo.
Missouri, Iowa & Nebraska.	Wm. Adams.		Alexandria, Mo.

N

Nashville & Chattanooga.	John U. Eastman.	J. G. Sawyer.	Nashville, Tenn.
New-Bedford & Taunton.	Robert Chase.	Robert Chase.	New-Bedford, Mass.
New-Brunswick.	P. Logan.	C. M. Kinnon.	Fredericton, N. B.
New-Brunswick & Canada.	Tho. Armstrong.	G. Houlton.	St. Andrew's, N. B.
New-Haven & Northampton.	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland.	C. J. Clifford.		Wortendyke, N.J.
New-York, Kingston & Syracuse.	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem.	Wm. M. Strong	C. E. Garey.	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division.	‡G. B. Van Vorst	D. Hoit.	West-Albany, N. Y.
New-York Central Division.	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division.	Amos Gould.	James Leary.	Rochester, N. Y.
New-York Central Division.	Jas. Butman.	Wm. Johnson.	Buffalo, N. Y.
New-York Central Division.	S. L. White.	George Rowe.	Niagara Falls, N. Y.
Hudson River Division.	‡Wm. Buchanan.	E A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch.	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal.		H. A. Webster	Dutchess Junc., N.Y.
New-York & Oswego Midland.	‖Wm. H. Griggs.	Wm. H Griggs	Oswego, N. Y.
Eastern Division.		J. A. Read.	Middletown, N. Y.
Middle Division.	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day.	Oswego, N. Y.
New-York & New-England.	Geo. E. Boyden.	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas H. Anderson.	Providence, R I.
New-York, New-Haven & Hartford.	§§H. Kittendorf	James Denver.	New-Haven, Ct.
New-York, New-Haven & Hartford.	J. O. Chapman.	F. Leppens.	Hartford, Ct.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio.	John R. Jordan.	John R. Jordan.	Paducah, Ky.
New-Orleans, Jackson & Gt. Northern.	N. Greener	N. Greener.	New-Orleans. La.
Naugatuck.	Henry Hanford.	George W. Gray.	Bridgeport, Ct.
North-Carolina.	Rufus D. Wade.	B. G. Sergeant.	Co. Shops, N. C.
North-Louisiana & Texas.	C. H. Tull.		Monroe, La.
New Orleans, Mobile & Texas.	H. C. Knapp.	D. C. Roland.	Mobile, Ala.
Northern Central.	C. M. Lewis.		Baltimore, Md.
Northern Central.		G W. Demarest.	York, Pa.
North Lebanon		Henry B. Cves.	Lebanon. Pa.
North-Pennsylvania.	Franklin Roop.	Franklin Roop.	Philadelphia, Pa.
North Eastern.	D. W. Haines.	A. M. Corrie.	Florence, S. C.
Northern.	James W. Lander.	Albert Langmaid.	Concord, N. H.
Norwich & Worcester.	Richard Colburn.	G. R. Bentley.	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific.	**H. A. Towne.		St. Paul, Minn.
Minnesota Division.	W. H. Lewis	W. S. Heathcote.	Brainerd, Minn.
Lake Superior & Miss. Div.	G. H. Smith.	John Hill.	St. Paul, Minn.
Dakota Division.	C. W. Rossiter.		Fargo, D. T.
Pacific Division.	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport.	J. K. Taylor.	A. Gleason.	Boston, Mass.
Oil City & Pithole.	George Thompson.		Pithole, Pa.
Oil Creek & Alleghany River.	H. J. Bookhammer.	Jacob Williams.	Oil City, Pa.
Oil Creek & Alleghany.	H. J. Bookhammer.	John Monks	Oil City, Pa
Ohio & Mississippi.		G. Hibbard.	Cochran, Ind.
East Division.	A. Thompson.		Cochran, Ind.
West Division.	H. Elliott.		East St. Louis, Ill.
Oregon & California.	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville.	J. R. Osborne.		Owensburg, Ky.

P

Paducah & Memphis.	Alex. Forsyth.		Paducah, Ky.
Painesville & Youngstown.	G. R. Crane		Painesville, Ohio.
Paris & Decatur.	John G. Clifford.	G. Clifford.	Paris, Ill.
Panama.	Chas. E. Stewart.	J. G. Wilson.	Aspinwall, N. G.
Pacific of Missouri.	§§John Hewitt.	E. Martin.	St Louis, Mo.
Pennsylvania.	§§Frank Thomson.		Altoona, Pa.
Pennsylvania.	H. D. Garrett.	I. W. Van Houten.	W. Philadelphia, Pa
Pennsylvania.	E. L. Caum.	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania.	G. W. Strattan.	John P. Levan.	Altoona, Pa.
Pennsylvania.	D. O. Shaver.	R. S. Ramsey.	Pittsburg, Pa.
New-Jersey Division.		David H. Baker.	Jersey City, N. J.
West-Penn. Division.	C. B. Street.	James F. Elder.	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore.	S. A. Hodgman.	Wm. T. Worth.	Wilmington, Del
Philadelphia & Baltimore Central.	S. D. Danfield.	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie.	Martin Walls		Sunbury, Pa.
	W. L. Forster.		Renovo, Pa.
	W. L. Holman.		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading.	L. B. Paxson.	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards.		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis.			
Pittsburg & Columbus Division.	E. Pierce.	Thos. D. Furgusen	Dennison, Ohio.
Little Miami Division.		M. P. Ford.	Columbus, Ohio.
Little Miami Division.	J. H. Setchel.		Pendleton, Ohio.
Col., Cin. & Ind. Division.	Robert Curtis.	Tho. Chamberlin.	Columbus, Ohio.
Col., Cin. & Ind. Division.	Geo. H. Prescott	Geo. H. Prescott.	Logansport, Ind.
Peoria & Rock Island.	Geo. Gregg.		Peoria. Ill.
Pittsburg & Connellsville	J. E. Sampsel.	J. M. Leech.	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings.	John Marquis.	Allegheny, Pa
Pittsburg, Fort Wayne & Chicago.	J. M. Boon.	Israel Lee.	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago.		J. J. Kirkland.	Crestline, Ohio.
Pittsburg, Virginia & Charlston.	W. Lininger.		Pittsburg, Pa.
Pittsburg, Washington & Baltimore.	Wm. Stearns.		Connellsville, Pa.
Peoria, Pekin & Jacksonville.	R. F. Hurd.	Jas. J. Doyl.	Pekin, Ill.
Portland & Rochester	John G. Brady.	John G. Brady.	Portland, Me.
Portland & Oxford Central.	Geo. W. Battles.	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth.	John Donnell		Portland, Me.
Port Royal.	C. W. Furber.	E. Hubard.	Port Royal, S C
Port Hope, Lindsay & Beaverton.	H. G Taylor	H. G Taylor	Port Hope, Can.
Providence, Warren & Bristol.	Rufus Smith	J. Brightman.	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth.	James Tucker	E. Fall	Union Village, N.H.
Petersburg & Weldon.	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester.	Joseph Kelly.	Olney L. Smith.	Providence, R. I.
Poughkeepsie & Eastern.	John L. Driscoll.	Jerry Wigg.	Poughkeepsie, N. Y.

Q

Quincy, Alton & St. Louis.	J. O. Gravell	W. G. Gilbert.	Quincy, Ill.
Quincy, Missouri & Pacific.	Geo. Adams.		Quincy, Ill.

R

Raleigh & Gaston.			Raleigh, N. C.
Richmond, Fredericksburg & Potomac.	H. Kuhn.	W. H. Trainham.	Richmond, Va.
Richmond, Danville & Piedmont.	John McFarland	J. B. Vaughan.	Richmond, Va.
Richmond & Petersburg.	John O'Brien.	H. L. Carter.	Richmond, Va.
Richmond & York River.	C. H. Harris.	J. L. Thompson.	Richmond, Va.
Rive De Loup.	P. A. Logan	C. R. McKinnin.	Fredericton, N. B.
Rome, Watertown & Ogdensburg.	Abram Klohs	H. H. Sessions.	Rome, N. Y.
Reading & Columbia.	B. Van Lew		Columbia, Pa.
Rome, Georgia.	O. W. Harbin.	O. W. Harbin.	Rome, Ga.
Rochester & Genesee Valley.	M. E. Brown.	M. Wilder.	Buffalo, N. Y.
Rockford, Rock Island & St. Louis.	Joseph Elder.	T. F. Nolte.	Beardstown, Ill.

S

Saginaw Valley & St. Louis.	W. S. Thompson.		Saginaw, Mich.
Savannah & Charleston	P. J. Hutson.	J. D. Murphy.	Charleston, S. C.
Selma, Marion & Memphis.	R. H. Anderson.		Marion, Ala.
Southern Pacific of California.	J. P. Wilson.	F. N. Bellisle.	San Francisco, Cal.
St. Croix & Penobscot.	Edward Bolton.	A G. Page.	Milltown, Me.
St. Lawrence & Ottawa.	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern.	O. A. Haynes.	Oscar Doolittle.	Carondelet, Mo.
St. Joseph & Denver City.	E. Sleppy.		St. Joseph, Mo.
San Antonio & Mexican Gulf.	W. T. Bingham.		Victoria, Texas.
South Side of Long Island.	A. P. Doane.	A P Doane.	Williamsburg, L. I
St. Paul & Pacific.	J. C. Monroe	T. W. Heathcote.	St. Paul, Minn.
St. Paul & Sioux City.	F. C. Butterfield.	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle.	H. Kirmse.	Terre Haute, Ind.
Indianapolis Division.	Wm. Riley		Terre Haute, Ind.
Vandalia Division.	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith.	John Reed	Charleston, S. C.
Southern Central.	Chas. G. Brown.	H. Mooney.	Auburn, N. Y.
Southern Minnesota.	James Waters.		Wells, Minn.
South-Western of Georgia.	C. D. Wall.		Columbus, Ga.
South-Western of Georgia.	D. M. Gogul	James A. Knight.	Macon, Ga.
South Shore	Warren E Ray.		Cohasset, Mass.
Stanstead, Shefford & Chambly.	W. H. Smith.		Waterloo, C. E.
Seaboard & Roanoke	§A. Pendleton		Portsmouth, Va
Stonington & Providence.	J. H. Anderson.	J. H. Anderson.	Providence, R. I
Selma & Gulf.	Wm. T. Haughtrey.		Selma, Ala.
Selma, Rome & Dalton.	A. G. Mames.	W. W. Peirce.	Selma, Ala.
Sioux City & Pacific.	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern.	W. E. Granger		Springfield, Mass
Sheboygan & Fond du Lac	John Hickey	John Hickey.	Sheboygan, Wis.
Sullivan & Erie.			Tonawanda, Pa.
Syracuse, Binghamton & New-York.	H. H. Dawson	David Burling.	Syracuse, N. Y.
Syracuse Northern.	W. Garrison.	L. W. Smith.	Syracuse, N. Y.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern.	‖‖L. B. Salisbury.		Mt. Vernon, Ill.
Nashville Division.	‖H. H. Osborne.		Edgefield, Tenn.
St. Louis, Kansas City & Northern.	H. S. Smith.	C. S. Buck	Moberly, Mo.

T

Taunton Branch.	W. M. Parks.	J. G. Codding.	Taunton, Mass
Terre Haute & Indianapolis.	C. R. Peddle.	H. Kirunse.	Terre Haute, Ind.
Tioga	Peres Bonny.	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans.	R. B. Baer		Houston, Texas.
Texas & Pacific.	W. H. Hipple.		Marshall, Texas
Tennessee & Pacific.	William McKeand.	William McKeand.	Nashville, Tenn
Toledo, Wabash & Western.	§J. B. Morse.		Fort Wayne, Ind
Toledo, Wabash & Western.	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann.		Springfield, Ill.
Toledo, Wabash & Western.		U. H. Kohler.	Toledo, Ohio.
Toledo, Peoria & Warsaw.	W. O. Hewitt.	R. M. Hemphill.	Peoria, Ill.
Troy & Boston.	Foster Church	R. V. Coon.	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus.		Toronto, Canada.

U

Union Pacific.	§I. H. Congdon	‡‡Geo. E. Stevens.	Omaha, Nebraska.
Eastern Division.	‖A. M. Collett.		Omaha, Neb.
Eastern Division.	‖H. P. Makely.		Grand Island, Neb.
Mountain Divison.	‖Jno. E. Davis.		Cheyenne, W. T.
Laramie Division.	‖Floyd Heavaner.		Laramie, W. T.
Western Division.	‖C. A. Phipps.		Evanston, U. T.
Utah Central.	Thos. Pierpont.	Thos. Pierpont.	Salt Lake City.
Utica & Black River.	John Bailey.	David James.	Utica, N. Y.
Utica, Chenango & Susquehanna.	C. H. Brown.		Utica, N. Y.

V

Vicksburg & Brunswick.	James Boon.	J. A. Knight.	Eufaula, Ala.
Vicksburg & Meridian.	Jas. B. Browne.		Vicksburg, Miss.
Vermont Central.	J. M. Foss.	J. M. Foss.	St. Albans, Vt.
Rutland Division.	N. L. Davis.		Rutland, Vt.
New-London Northern Division.	J. W. Dow.	S. W. Caulkins.	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short.	J. R. Ames.	Malone, N. Y.
Vermont & Massachusetts.	D. T. Davis.	Jacob Marsh.	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern.			Alexandria, Va.
Western Union.	John Taylor.	E. A. Eddy.	Racine, Wis.
Wilmington, Columbia & Augusta.	W. H. Turrintine.		Wilmington, N. C.
Westchester & Philadelphia.	John Moyer.	N. Pawling.	Philadelphia, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass.
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H. Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	C. Hamilton		St. Louis, Mo.
Cairo & Vincennes	L. W. Palmer		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*J S. Casement		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee, Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart		Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡W. B. Strong		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen.		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Pekin & Southwestern	N. V. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati Lafayette & Chicago	E. H. Waldron		Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough		Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Akron, Ohio.
Colorado Central	T. E. Sickles		Golden, Col.
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin.	H. E. Chamberlin.	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer	G. W. Bleashing	Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer.	" "
Detroit, Hillsdale & Indiana	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese.		Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.

E

East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Elizabethtown & Paducah		D. Brock	Elizabethtown, Ky.
Elizabethtown & Paducah	D. F. Whitcomb		Louisville, Ky.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Haywood.	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw, Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson		Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana		William Mullins.	Pittsburg, Pa.
Grand Trunk		John Taylor	Montreal, Canada.
East Division	Henry Bailey		
West Division	W. J. Spicer		
Grand Tower and Carbondale	H. V. Olyphant.	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla.	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	William K. Muir.	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis	Horace Scott	Wm. Mullins	Pittsburg, Pa.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Pacific	Edward S. Bowen		Kansas City. Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton.	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H Briggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. L. Holden	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong.	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	J. C. Hadley		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Robert Meek		Clarksville, Tenn.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	M. Stanton		Birmingham, Ala.
Louisville, Cin. & Lexington	George Skinner	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.

M

Macon & Brunswick	William McRae	Solomon Hass	Macon, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta & Pittsburg	A. J. Warner	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	C. E. Van Cleve	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	A. S. Livermore		Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	H. E. Sargent		Detroit, Mich
Michigan Central		John Newell	Detroit, Mich.
Grand River Valley Division	Chas. Desmond.		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	Geo. C. Hopper		Saginaw City, Mich.
South-Haven Division	Geo. E. Curtiss		Kalamazoo, Mich.
Joliet Division	Carlton Wheeler		Joliet, Mich.
South-Bend Division			
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers.	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	W. Elwell		Sheboygan, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Milwaukee & St. Paul	*S S. Merrill	Rob't Wason	Milwaukee, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mississippi Central	R. N. Colquhoun.		Water Valley, Miss.
Mississippi Central	*E. D Frost	S. H. Edgar, V. P.	New-Orleans, La.
Mississippi & Tennessee	M. Burke	M. Burk	Memphis, Tenn.
Mississippi Valley & Western	E. P. Buell		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas		G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Holden, Mo.
Eastern Division	Mark M. Towne		Hannibal, Mo.
Sedalia Division	Mark M. Towne		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	A. L. Rives	C. E. Rushing	Mobile, Ala.
	Cecil Fleming		Mobile, Ala.
	E. S. Hosford		Macon, Miss.
	M. M. Miller		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.

N

Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart	Tho. H. Little	St. Andrews, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury.	W. A. Waterbury	Middletown, Ct
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, Jackson & Great Northern.	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. M. Wilcox		New-Haven, Ct.
New-York, Boston & Montreal	C L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest.	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo. N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews.		Worcester, Mass.
New-York & Oswego Midland.	C. W. Douglas	P. Bundy	New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division.	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	A. R. Fiske		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.

O

Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	J. J. Lawrence		Pittsburg, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.

P

Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania		Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	W. H. Brown		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pensacola & Louisville	L. H. Sellars		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
Pittsburg & Cin. Division	George Webb		Pittsburg, Pa.
Little Miami Division	J. D. Ellison		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
Eastern Division	Richard Wiggin		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	S. C. Millett		Port Royal, S. C.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner.	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberliu		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.

Q

Quincy, Alton & St. Louis	N. J. T. Dana	D. A. Sweet	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.

R

Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw.		Richmond, Va.
Rockford, Rock Island & St. Louis	R. R. Cable		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.

S

St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lineoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute.	W. G. Broughton		St. Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper.	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern.	*E. F. Winslow	C. W. Gardiner	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	A. E. Shrader		Henderson, Ky.
St. Louis, Kansas City & Northern	W. C. Van Horne.	R. W. Green	St. Louis, Mo.
St Louis Division	J. L. Hinkley		St. Louis, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson.		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	E. G. Barney		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Sheboygan, Wis.
Shenango & Allegheny	A. L. Dunbar		Meadville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern			Sodus Point, N. Y.
South-Shore	J. R. Kendrick.		Boston, Mass.
South-Side, Long Island	L. S. Canfield		Brooklyn, N. Y.
South-Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern Minnesota	*H. W. Holley		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield & Ill. South-Eastern.	*C. A. Beecher		Springfield, Ill.
Staten Island	J. W. Wlbur		New-York, N. Y.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. C. Belden		Syracuse, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing.	Syracuse, N. Y.

T

Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson	C. R. Peddle	Indianapolis, Ind.
Texas & New-Orleans	R B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble	J. F. Dixon	Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria & Warsaw	W. H. Cruger	Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio.
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.

U

Union Pacific	S. H. H. Clarke	T. E. Sickles	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City.
Utica & Black River	T. W. Spencer		Utica, N Y.
Utica, Ithaca, & Elmira.	H. P. Goodrich		Ithaca, N. Y.

V

Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.
Vicksburg & Brunswick	Virgil Powers	H. Young	Eufaula, Ala.
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.

W

Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine. Ont.
Wellsboro & Lawrenceville	A. H. Gorton		Corning, N. Y.
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Western & Atlantic	Wm. McRae		Nashville, Tenn.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
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Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F Devine		Atlanta, Ga.
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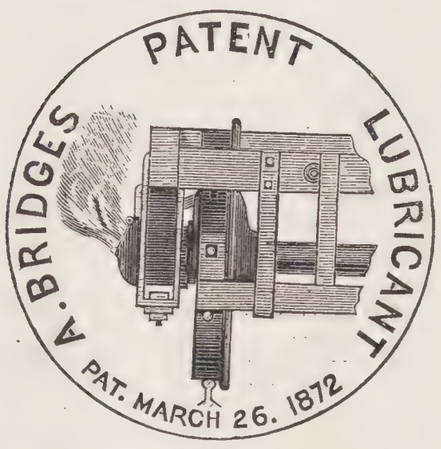

For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

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WM. COURTENAY, President. CHAS. F. COBB, Secretary.

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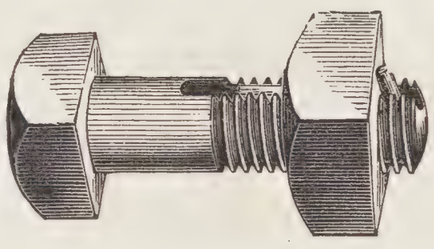
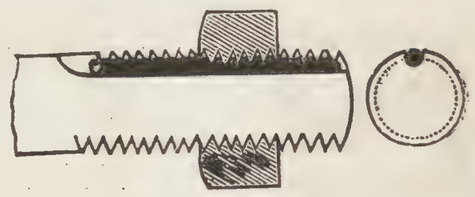


"CUMMING NUT-LOCK,"

Patented

June 16, 1868,

August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

JOS. W. SPRAGUE, Pres't and Sup't. **W. CRICHTON, Jr., Sec'y and Treas.**

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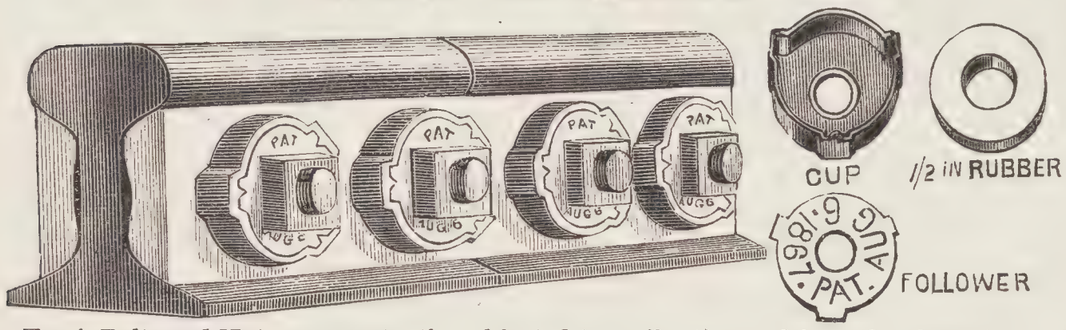
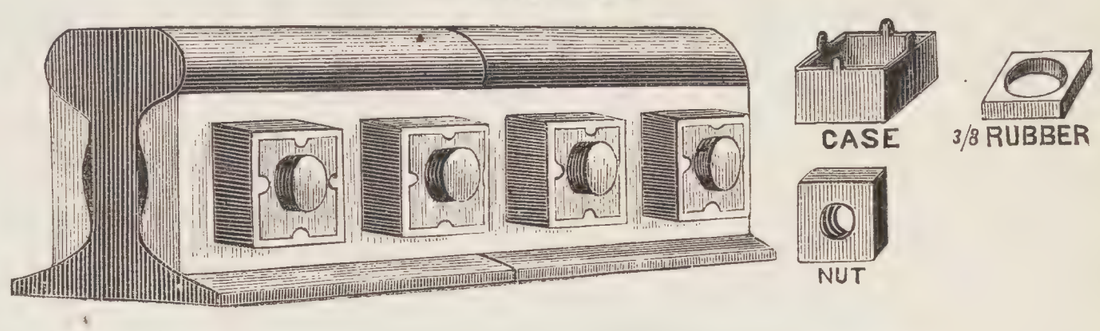


"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

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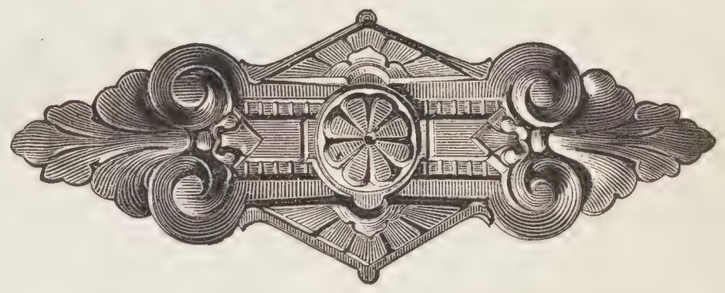

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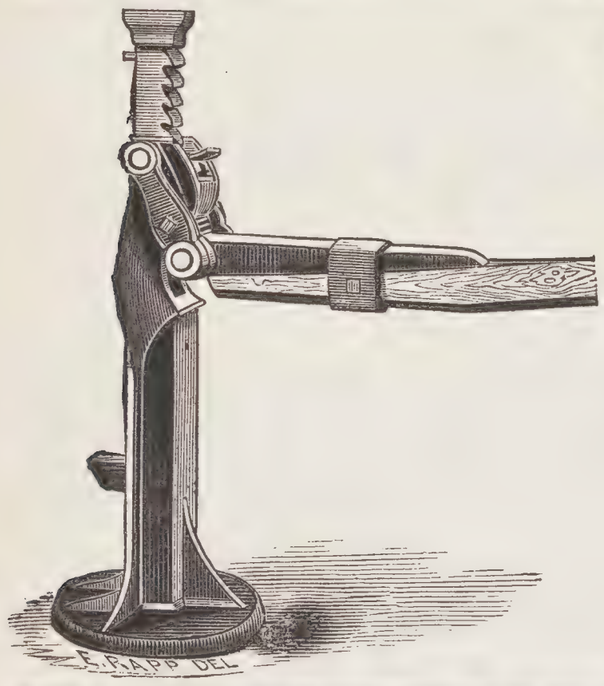

Leffel's Patent Lever Jack.

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ADAPTED TO ALL KINDS OF LIFTING,

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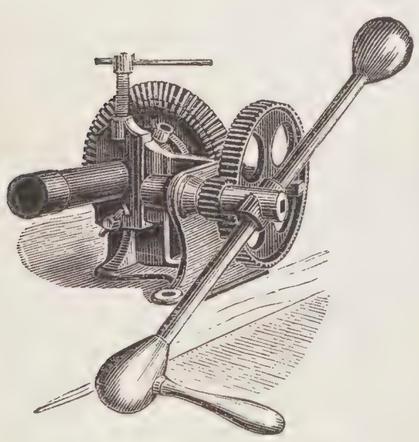
Pipe-Cutting and Threading Machine.

(W. D. CHASE'S PATENT.)



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine.

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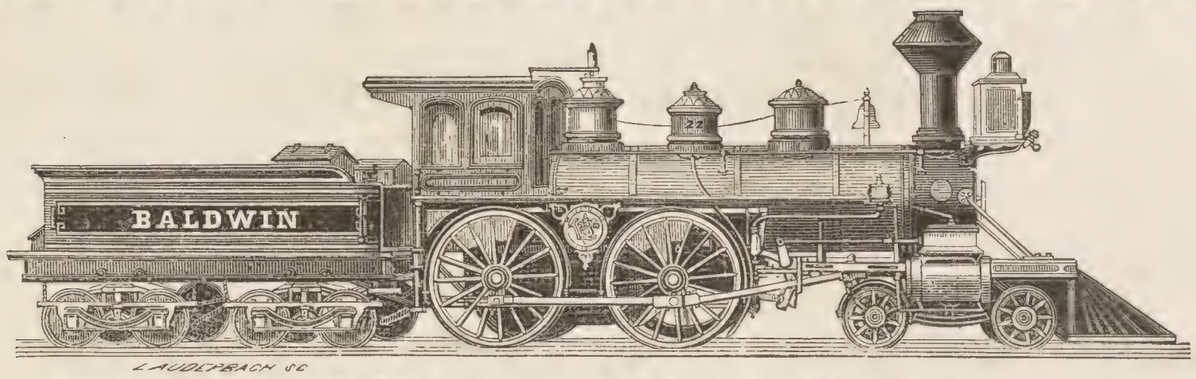

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☞ *All Work thoroughly interchangeable.* ☜

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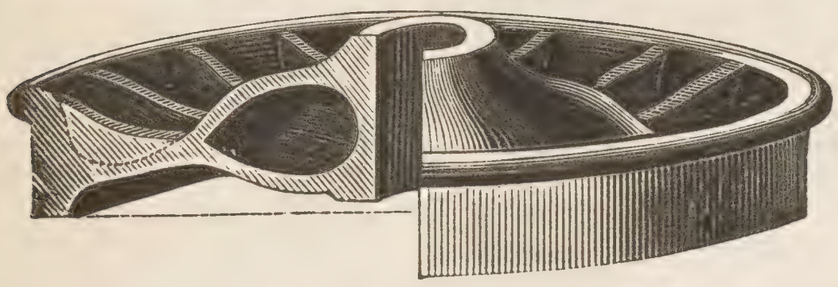

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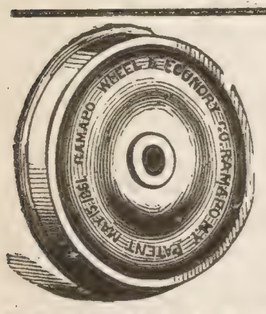

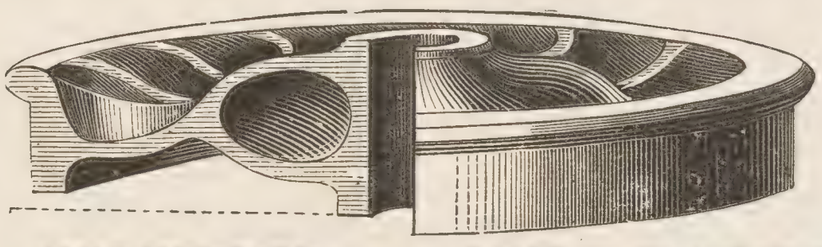

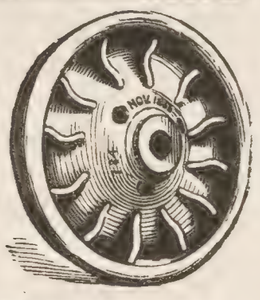

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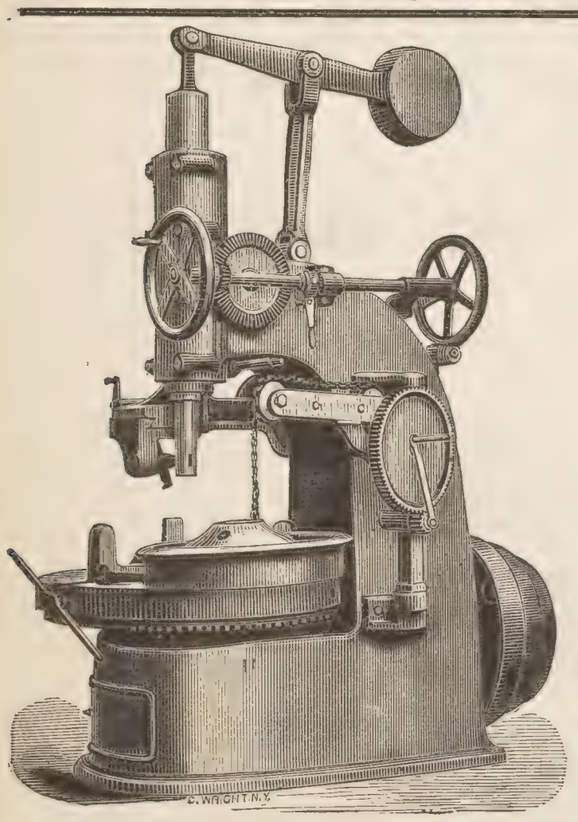

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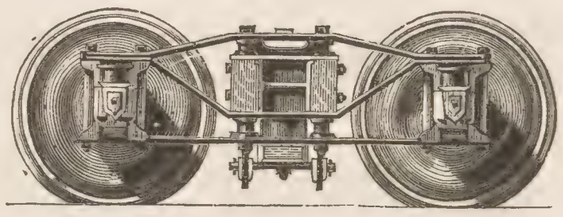
CENTRE-BEARING

Swing-Beam Truck,

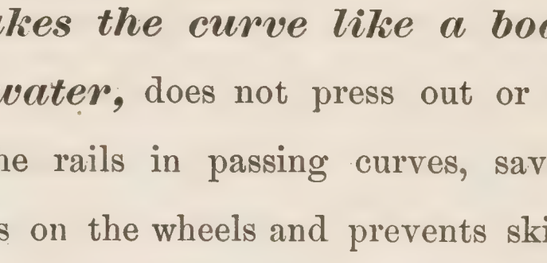
OR SO-CALLED "CALIFORNIA TRUCK."



This is a ***Centre-Bearing Swing-Beam Truck,*** and it is reported by the runners and engineers of motive power that the efficiency of such power is increased by the use of this truck from

Twenty to Twenty-five per Cent.

It takes the curve like a boat in the water, does not press out or endanger the rails in passing curves, saves the flanges on the wheels and prevents skidding. It is elastic, and enables the motive power to start with greater ease and with a greater number of cars, the vibration overcoming the inertia or rest upon the track. The leading features of the patent are the mechanical means employed by which the result is obtained. For the mechanical combination, the reader is referred to the patent issued April 24, 1866.



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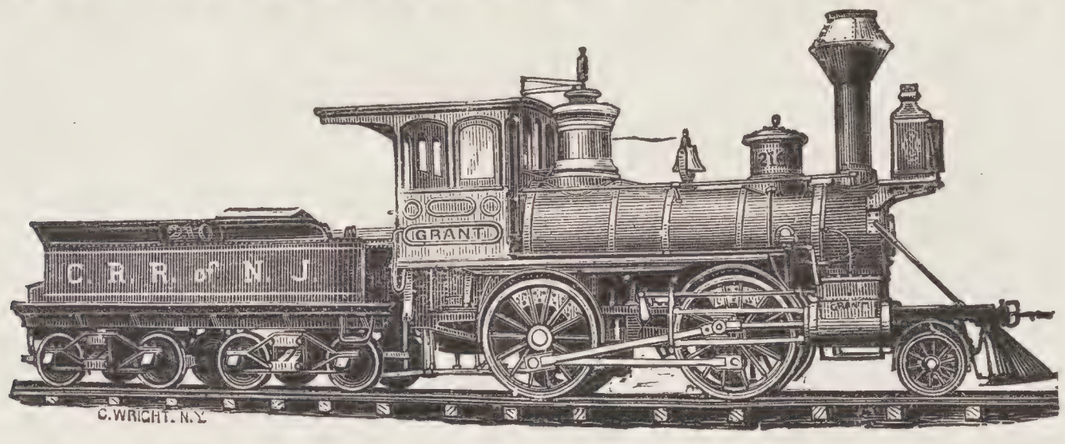

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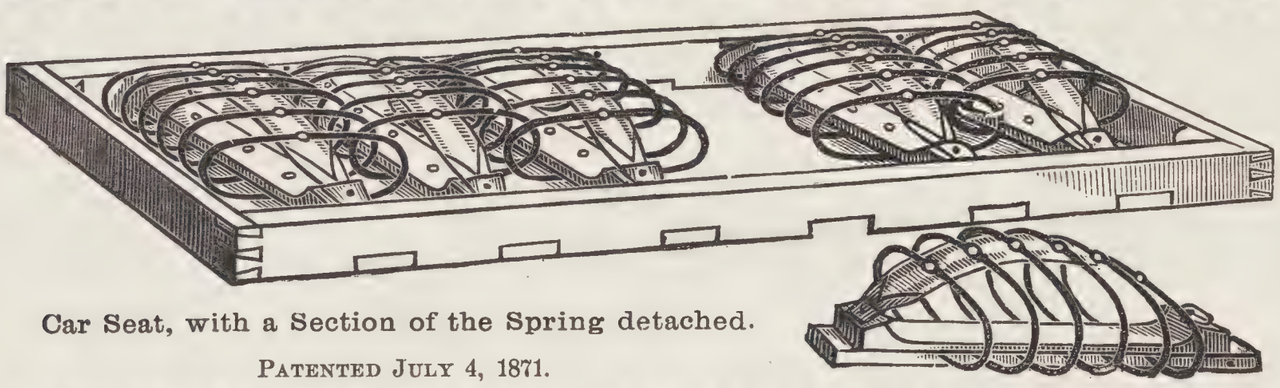

Car Seat, with a Section of the Spring detached.

PATENTED JULY 4, 1871.

FOR CAR SEATS AND SPRING MATTRESSES FOR SLEEPING CARS.

These Springs have been in successful operation on a large number of the leading railroads in the United States for over three years.

OFFICE OF PULLMAN PALACE CAR COMPANY,
CHICAGO, January 1, 1873.

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A. B. PULLMAN.

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"CAR HEAD LININGS"

OF THE MOST APPROVED STYLES AND PATTERNS

Either Full Decorated, Part Decorated, Encaustic, or Printed and Plain,

At Short Notice and in the Most Satisfactory Manner.

Orders will be received at the Factory, in New-Haven, Ct., or by

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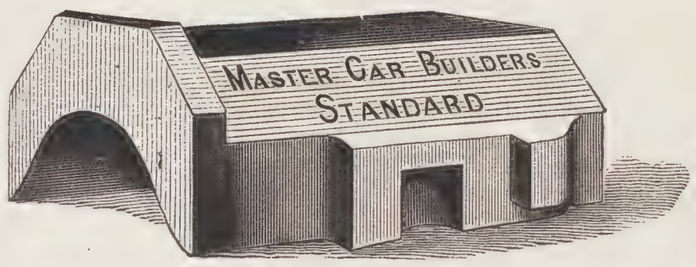
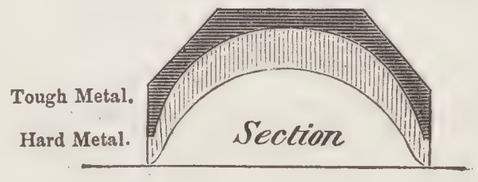
Also Oil Tank Cars, Boiler and Sheet Iron work of all kinds, Foundry Cupolas, Cranes, Ladles, etc.

SAMUEL FISK,
General Manager.

Patented Nov. 26th, 1872.





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MANUFACTURED BY

Geo. R. Meneely & Co., West Troy, N. Y.

Made in two sections, inseparably welded; the outer, composed of tough bronze, for strength; the inner, composed of hard bronze, for wear. Never heat, with ordinary attention, and are one third cheaper than common brasses for the same distance run.

Bearings made after the Master Car Builders' Standard Pattern kept in stock, and bearings of *any* pattern furnished promptly to order.

Refer to the New-York Central and Hudson River Railroad, Erie Railway, Boston and Albany Railroad, Delaware and Hudson Canal Company, The Wagner Drawing Room Car Company; Gilbert, Bush & Co., Troy, N. Y.; and The Wason Manufacturing Company, Springfield, Mass.

DOYLE'S
PATENT DIFFERENTIAL PULLEY BLOCKS.

These justly celebrated Pulley Blocks have now reached their **CROWNING PERFECTION** by the addition of

HALL'S PATENT IMPROVED YOKES.

By the use of these yokes we entirely overcome the difficulties experienced with all Differential Pulley Blocks, namely, the **TWISTING** of the **Chain**, and the **WEDGING** of the same between the keepers and the upper sheave—friction and wear are lessened, ease and safety are secured. For lifting heavy weights of all kinds these blocks are unequaled. **One man can hoist 1,000 lbs. with ease, and the Block will hold the weight at any point.** Made only of the best materials, tested by constant use, and approved by many of the leading manufacturers in the United States, we confidently commend them to the trade as the best Differential Pulley Block in the market. Circulars sent and orders promptly filled by

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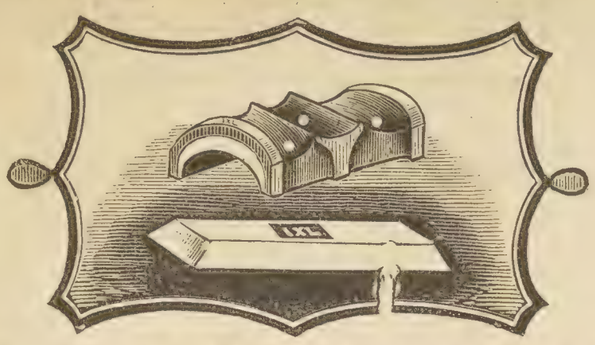

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THE NEW FLORENCE.

PRICE, $20 below } *any other first-class*
VALUE, $30 above } *Sewing Machine.*

SAVED, $50 *by buying the Florence.*

Every machine warranted.
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Special terms to clubs and dealers.
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Are in full operation and stocked with selected material for manufacturing

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RAILROAD LUBRICATING OILS.

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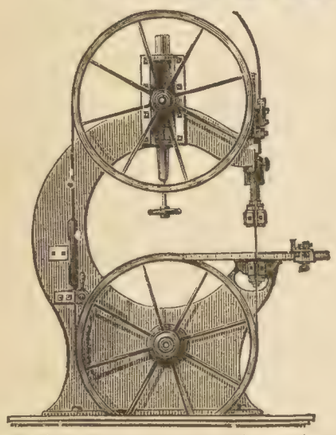

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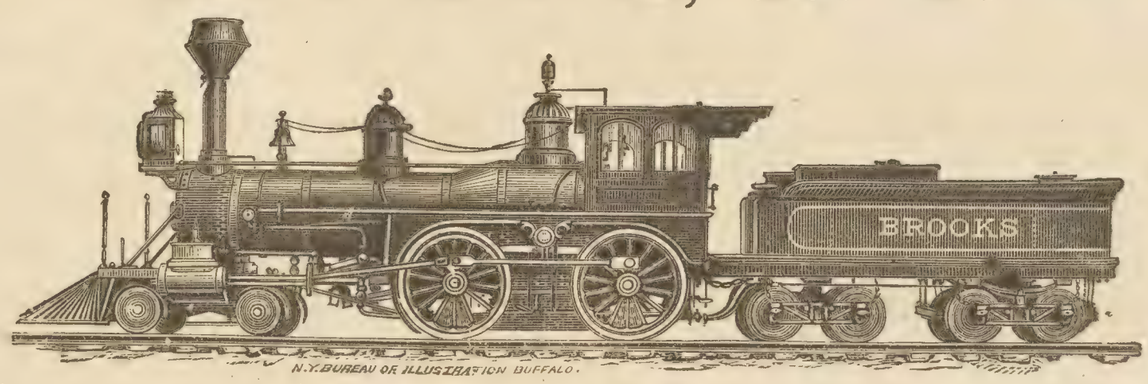

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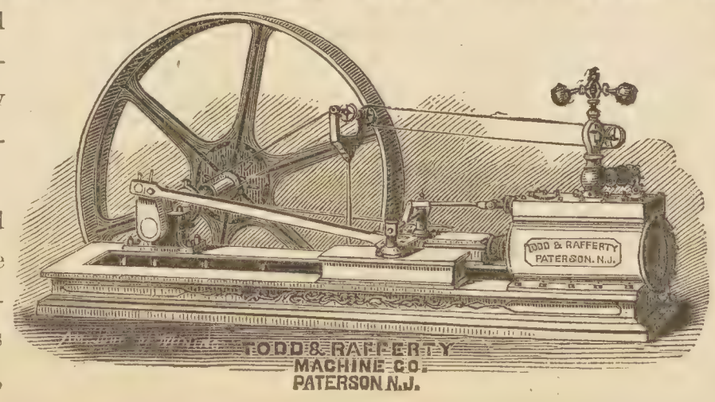

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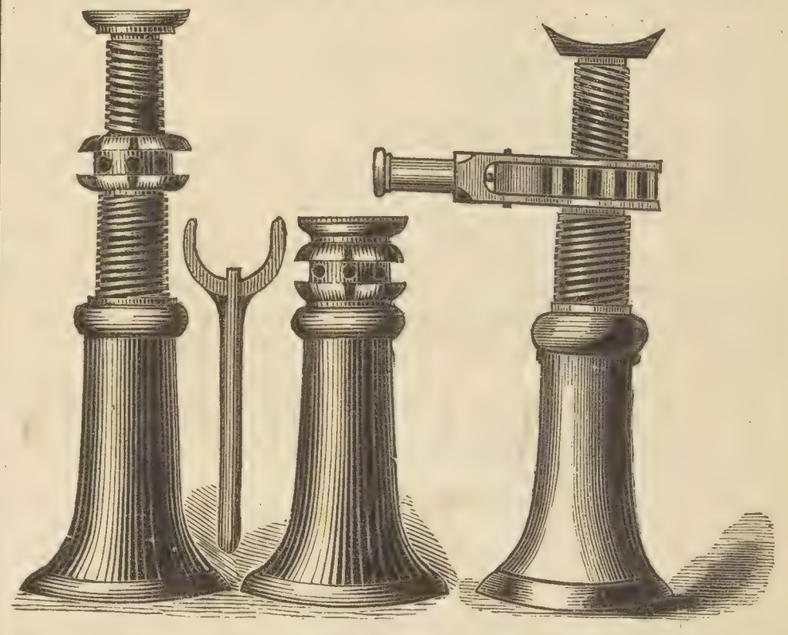

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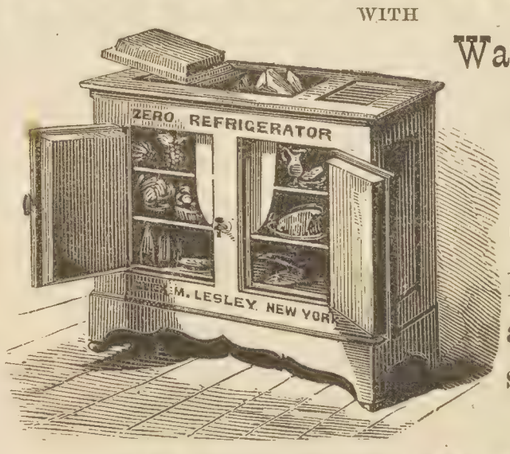

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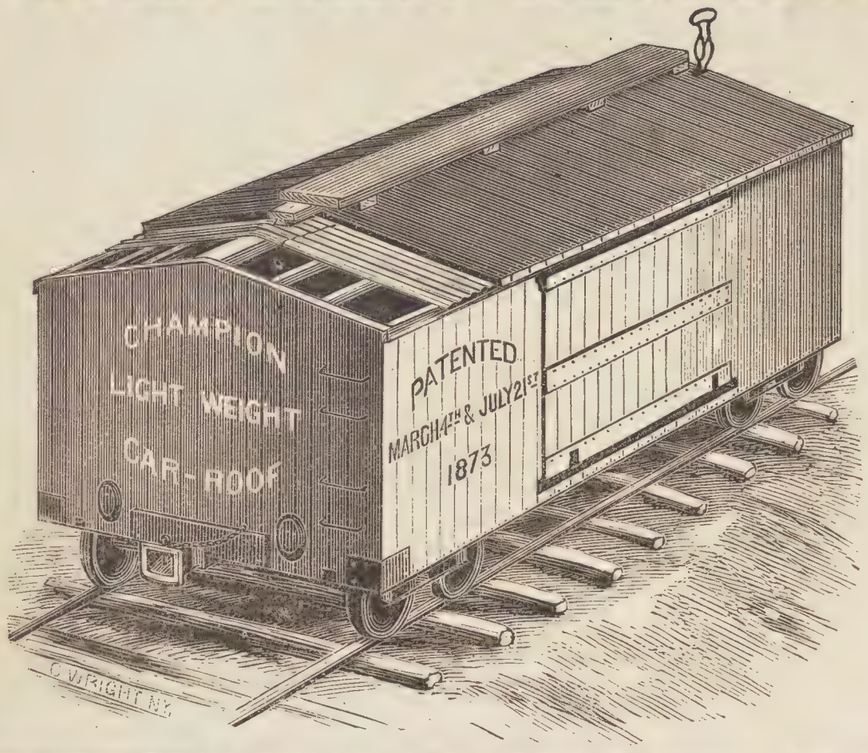

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Made of **Corrugated Zinc,** which can be utilized when the car is wrecked or worn out. Send for Circulars, etc., to

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MAHOGANY,

Walnut, Satin-Wood, Rosewood, Hungarian Ash, Amboine, Thuya, and all kinds of Hard and Fine Woods, in Logs,

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WE INVITE THE SPECIAL ATTENTION OF

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☞ Orders by mail promptly and faithfully executed.

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Manufacturer and Dealer in all kinds of

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Suitable for Car Builders' Use.

Also calls attention to his stock of

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French and American Burl Veneers, Birds-eye Maple and Ash Veneers, especially adapted for Car Panels, etc.

1-4, 3-8, and 1-2 inch Black Walnut, seasoned, for Panels.

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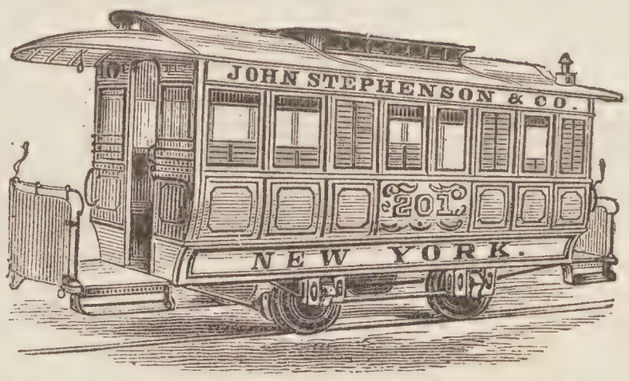

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Of every Variety, and combining all valuable Improvements.

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Chilled Iron Car Wheels,

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Passenger, Mail, Baggage, Box, Gondola, Coal,

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Also, Sperm Elephant, Whale, Paraffine, Machinery Elaine, and Olive Oils, for Railroads, Steamers, Woolen and Cotton Factories. Machinery and Burning.

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Cold drafts around car windows and doors in Winter **ENTIRELY EXCLUDED;** also, **Dust** and **Cinders** in Summer by **BROWNE'S** Metallic **RUBBER** Window and Door Bands. Stood the test **10 YEARS** on Drawing-Room and Sleeping Cars in the United States and Europe.

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"I have used, for several years, **BROWNE'S** Patent Metallic Weather Strips and Window Bands on our Drawing-Room and Sleeping-Cars to my **ENTIRE** satisfaction. They do not **CONTRACT** when exposed to the heat of the sun, nor **WARP** or **SPLIT;** and, in fact, they are a **STAPLE** article of practical utility, and I cheerfully recommend them.

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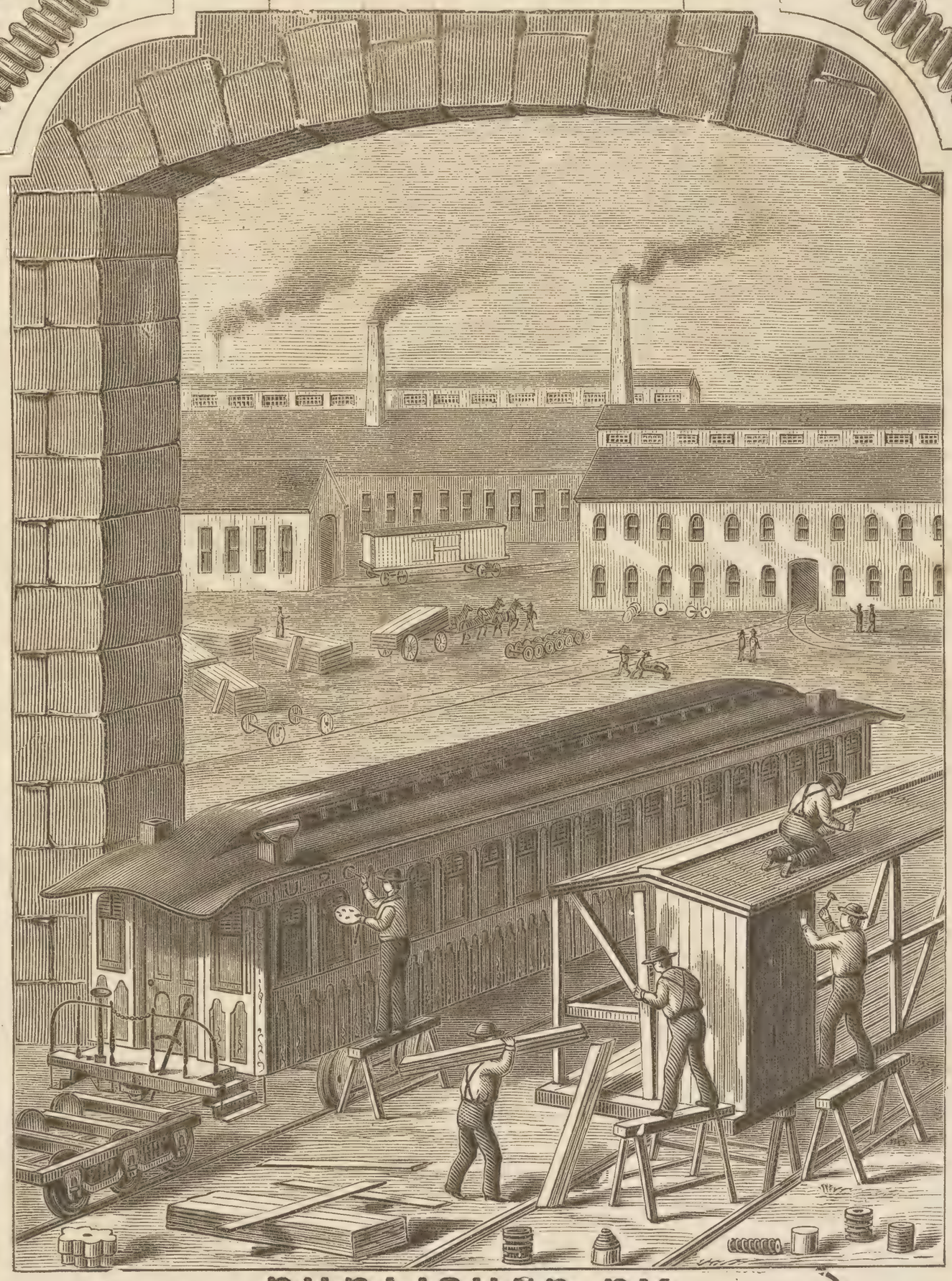
THE NATIONAL CAR BUILDER.

Devoted to the Interests of Railway Rolling Stock.

Vol. V. AUGUST, 1874. No. 8.



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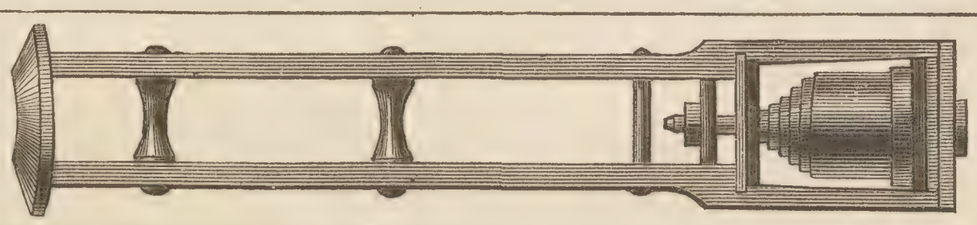

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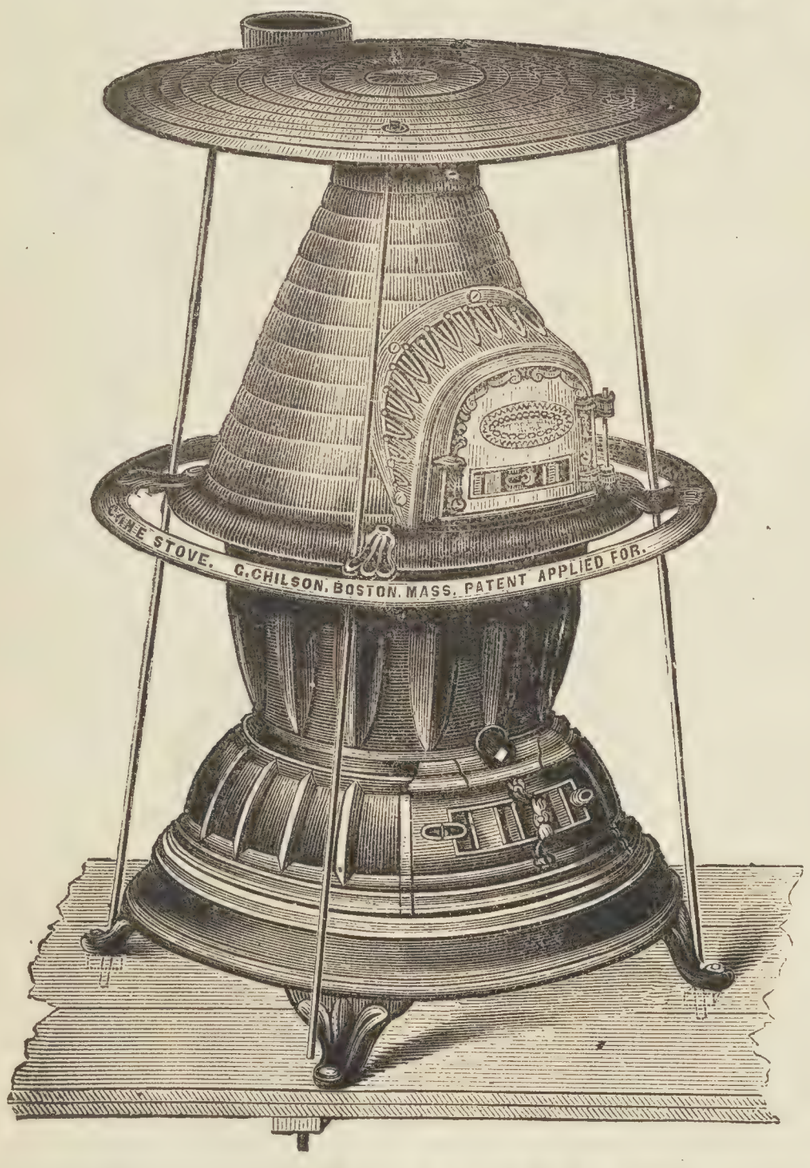
A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

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Railroad Track Tools

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If any particular pattern is desired, send sample, wood pattern, or drawing, otherwise we will send our own styles.

Our tools are all made by improved machinery, designed for this purpose, and are made of the best selected cast steel.

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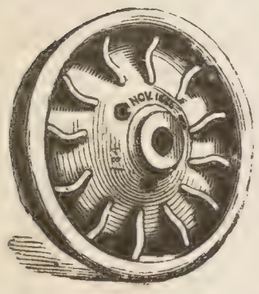
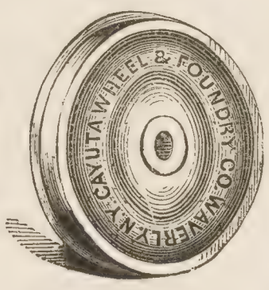


WHEELS



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WHEELS FITTED TO AXLES,

AND AXLES FURNISHED, IF DESIRED.

CASTINGS for all kinds of CARS, MINE CAR WHEELS, ETC.

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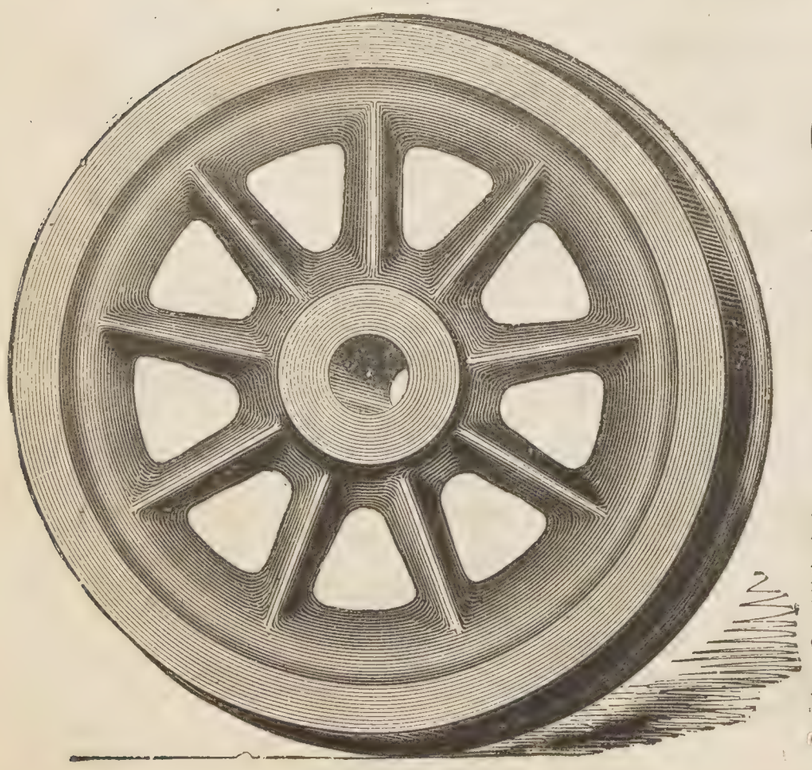
Baltimore Car-Wheel Company,

OFFICE, 15 SOUTH STREET



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City and Steam Railways

WITH OR WITHOUT AXLES.

WHEELS

OF ALL PATTERNS

MADE TO ORDER,

AND IN STOCK.

This Company using strictly Baltimore Charcoal Iron, which has no superior and few equals, for making Car-Wheels,) and annealing their Wheels by the most approved process, warrant them free from strain, and equal in tenacity and uniformity of chill to any made.

W. S. G. BAKER, Pres't.
J. M. LAWFORD, Sec'y.

Works, cor. Essex and Concord St., Canton, Baltimore, Md.

TODD'S

Patent Coupling,

FOR FREIGHT CARS.

First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins and links alone in a very short time, there being a link always in reserve, ready for use, without liability of being lost or stolen.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address *William Todd,* or

WILLIAMS, PAGE & CO.,

BOSTON.

Standard Car Axle-Boxes, Housings, and Jaws,

SUPPLIED TO ORDER BY

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(Take Arch, or Race and Vine Street Cars.)

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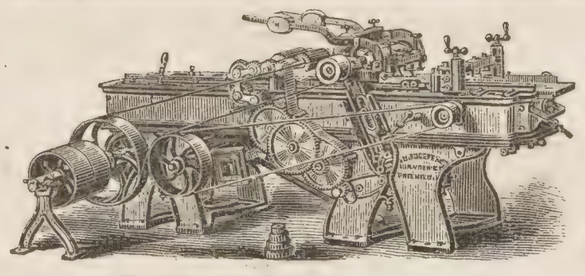

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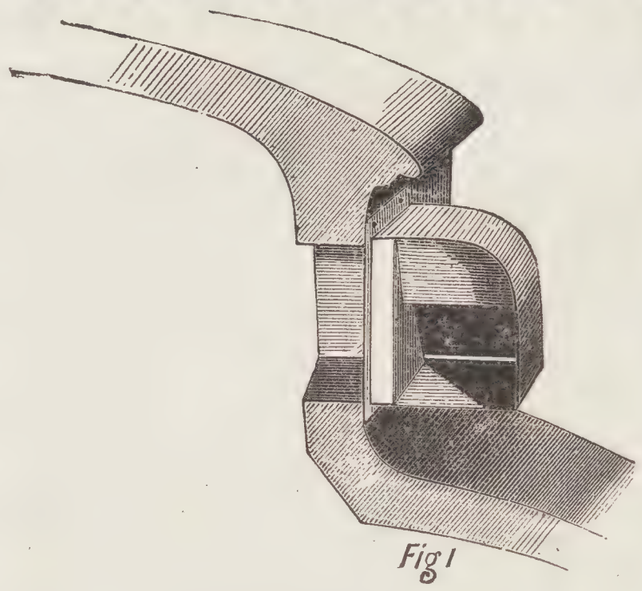

Fig 1

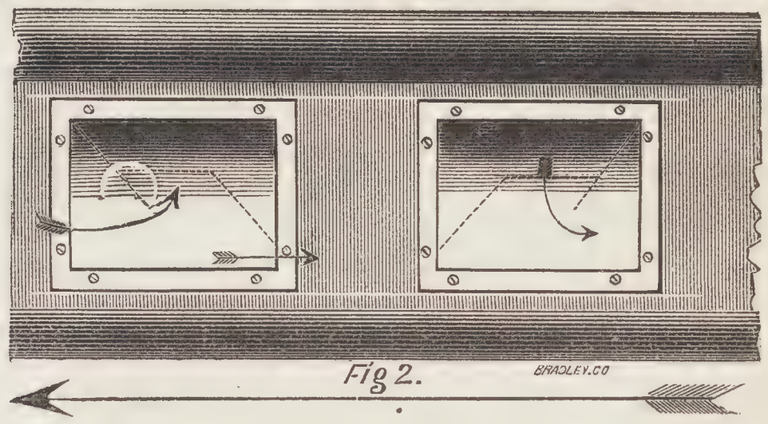

Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

H. D. CARROLL & CO., Springfield, Mass.,

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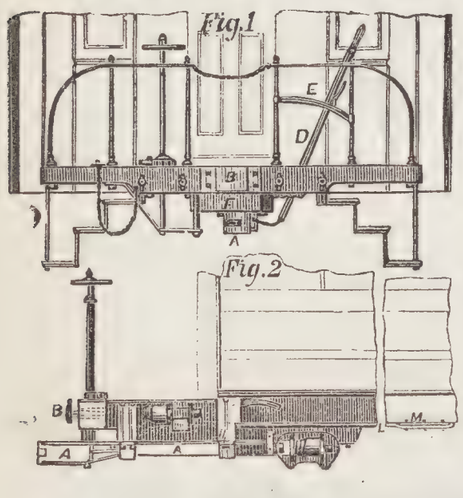

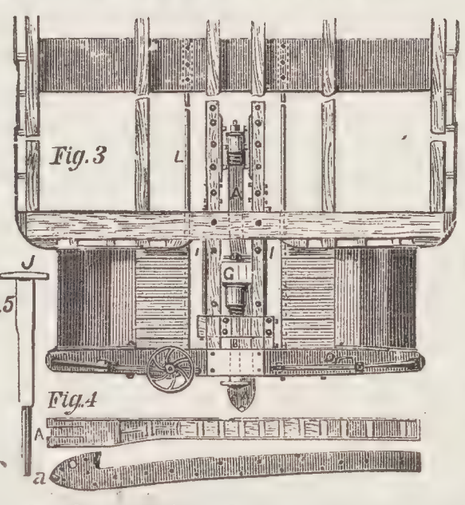

Office, 231 Broadway, (Rooms 4 and 5,) New-York.

Send for Illustrated Pamphlet, and call and see working models. **E. MILLER, Patentee.**

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied; and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook" A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

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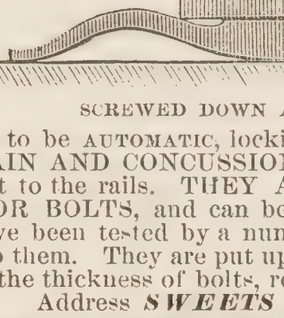

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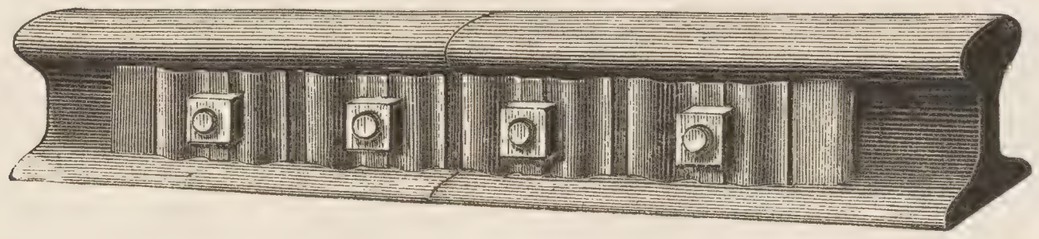

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These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

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For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.

The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident the eto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

FOR RAILROADS. AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Packing certain quantities of mineral oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather, an element that is lacking in mineral oil. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and mineral oil together. In cold weather, the combination is not so essential, but it will always be found economical to combine a small quantity of the Liquid with the mineral oil which is generally used upon railroads.

Where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes, and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used. We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

BOSTON, LOWELL AND NASHUA R. R. SUPERINTENDENT'S OFFICE,
P. NOYES, AGENT, BOSTON, April 13 1874.

Dear Sir: We have been using your LIQUID PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent thickening; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Bell and Leather Stuffing Co., CHICAGO, Dec. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C. B. & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING same as purchased of you before, and send as soon as possible.

H. I. HIGGINS, *Purchasing Agent Quincy Railroad.*

CHICAGO, ILL., May 7, 1874.

AGENT BELT AND LEATHER STUFFING CO.:
Dear Sir: You will please forward to the C. B. and Q. R.R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C. B. and Q. R.R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq.: ALBANY, Nov. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report;

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.

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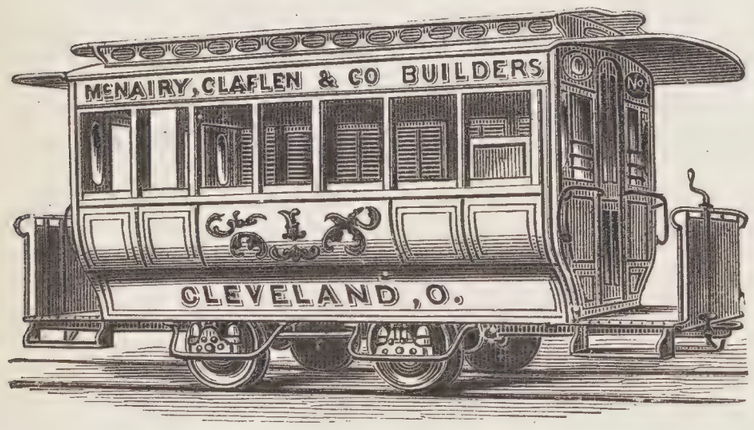

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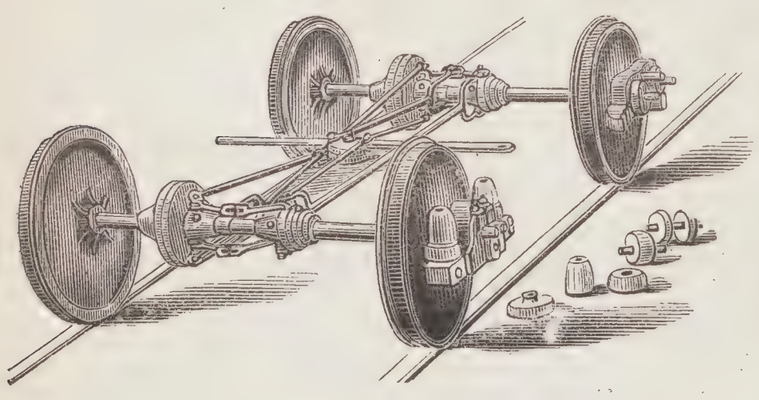

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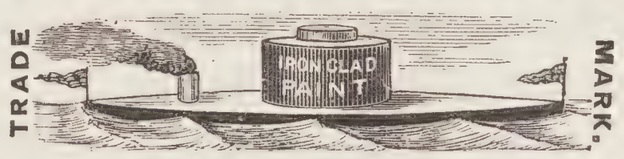

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☞ON TRIAL.—Sent on trial three months for Fifty Cents.

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FOR SHOP USE.

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WITHOUT BELTS OR BELLOWS.

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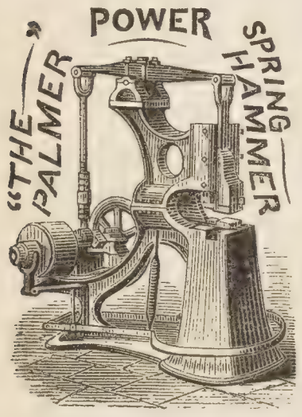

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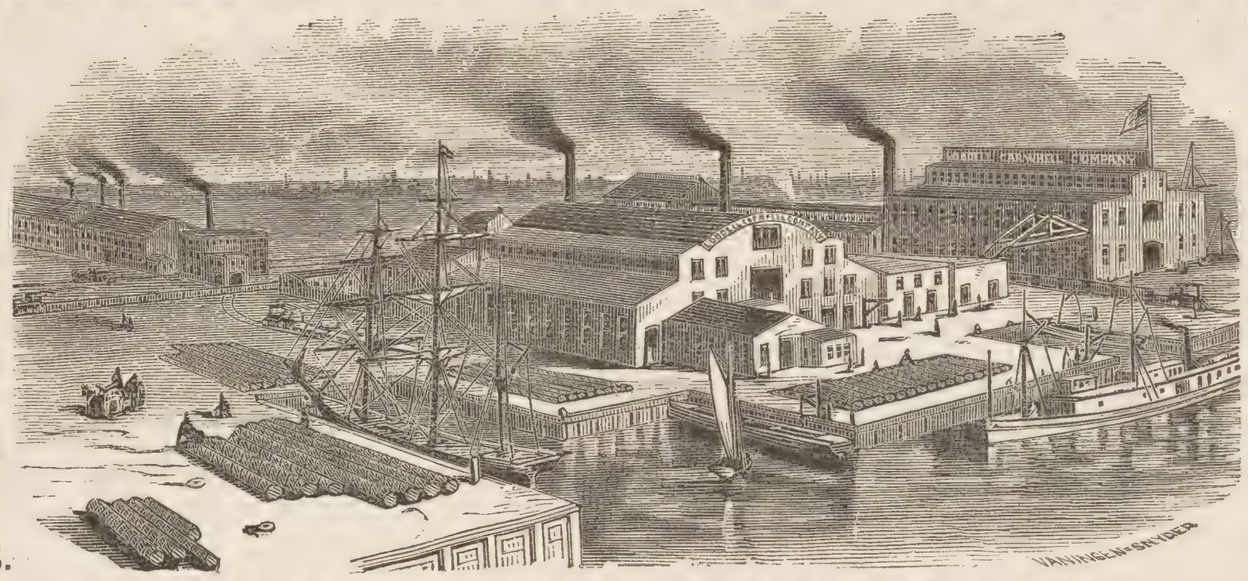

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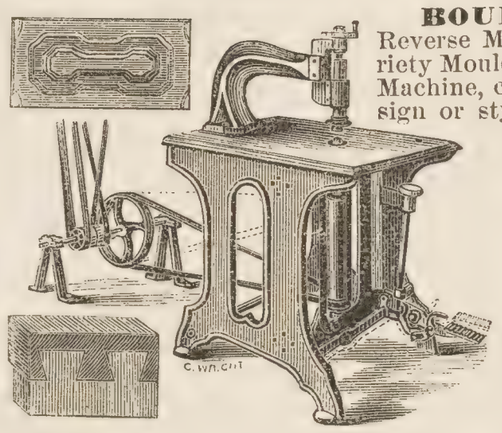

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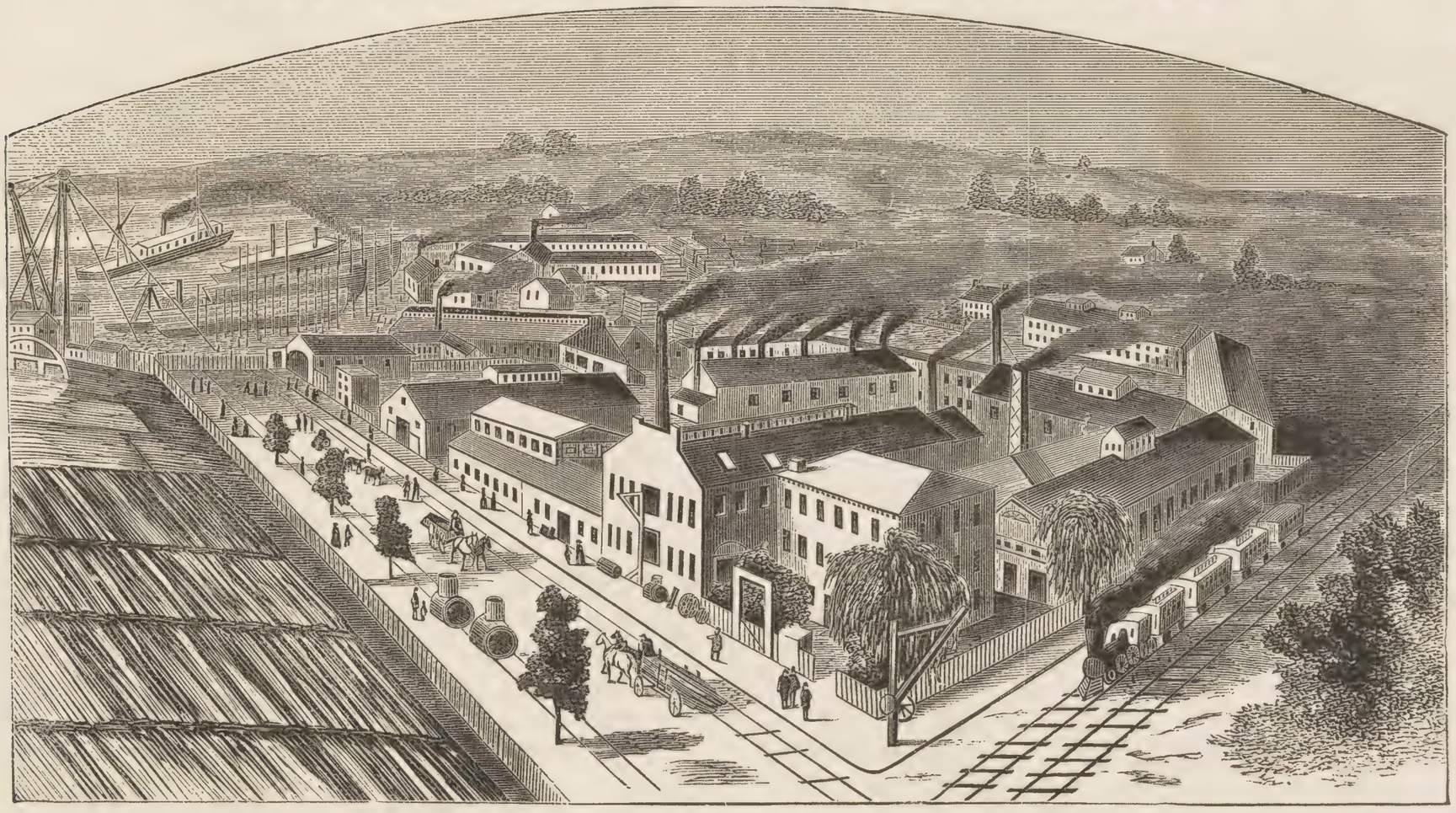

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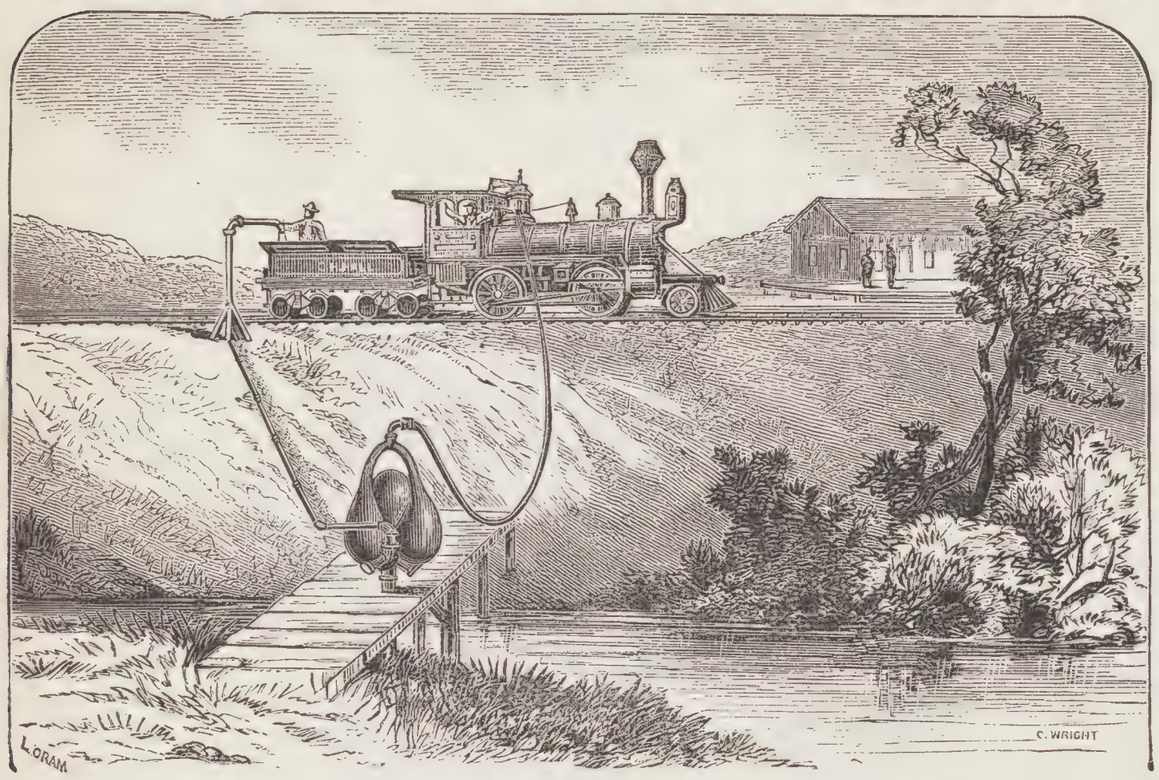

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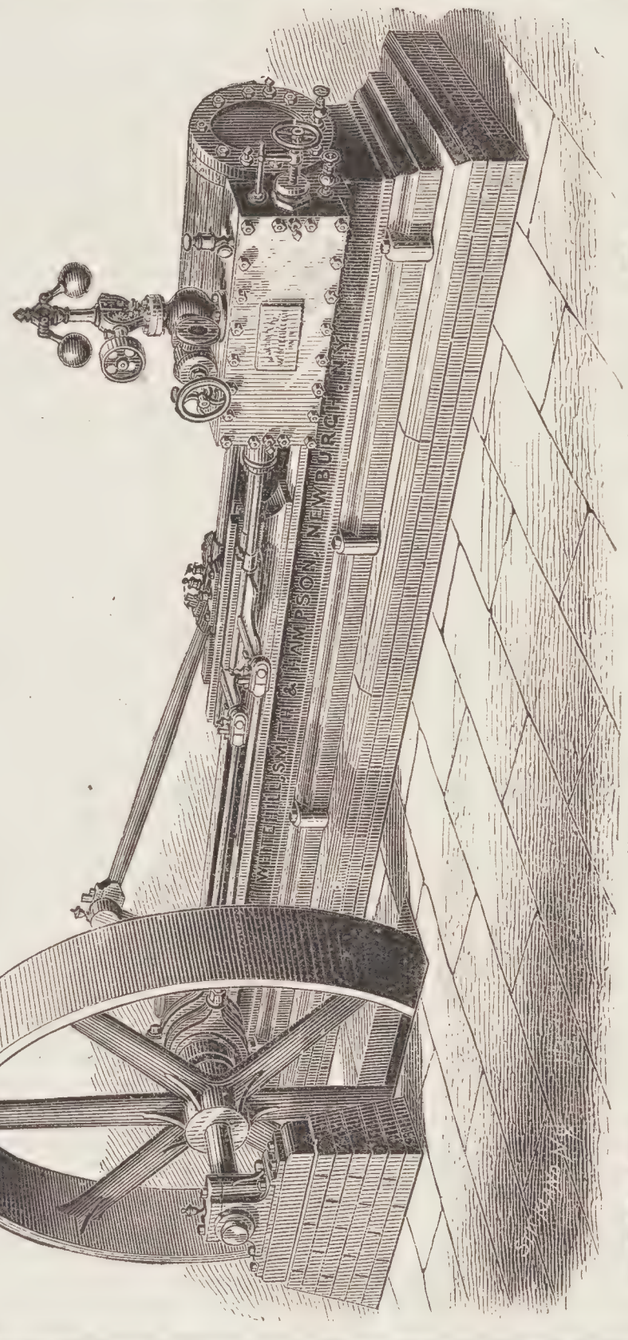

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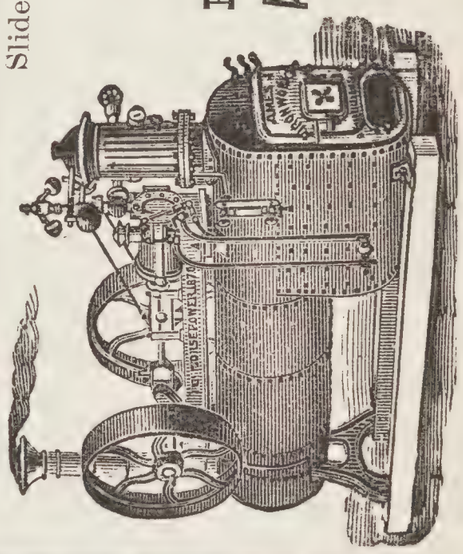

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Train Power-Brakes.

AT the recent Convention of the Master Car-Builders, the committee on the subject of brakes submitted the following :

REPORT.

To the Master Car-Builders' Association :

GENTLEMEN : Your committee, continued from last year, and to whom was referred the subject of brakes, respectfully submit this their second report.

In order to procure information, your committee, in December last, sent out 313 circulars containing the several questions hereinafter referred to, and in April last, 100 additional ones were sent to such members of the Association as had failed to respond to those first sent. Your committee also sent letters soliciting information in regard to the working and construction of different brakes, to the following parties :

Ranson & Gardner,	Cleveland, Ohio.
Wm. Loughridge,	Baltimore, Md.
S. N. Goodale,	St. Louis, Mo.
Tho. O. Ward,	Kalamazoo, Mich.
Westinghouse Air-Brake Co.,	Pittsburg, Pa.
John E. Worther,	Mobile, Ala.
J. Y. Smith,	New-York City.
M. W. Griswold,	New-York City.
Hugh L. McAvoy,	Baltimore, Md.
T. E. Sickles,	Omaha, Neb.
Robert J. Wilson,	Pittsburg, Pa.

In regard to the questions embraced in the circulars alluded to, the following is a summary of the replies made to each :

QUESTION 1. What kind of material do you use for brake-shoes ?

To this question, 64 replies were received, as follows : 53 report the use of cast-iron ; 3 of malleable iron ; 4 of wrought-iron ; 3 of cast and malleable, and 1 of oak-wood.

Q. 2. What is your experience with such material ?

To this question, 64 replies were received, embracing the following, which are given in the words of the writers :

William T. Worth, of the Philadelphia, Wilmington, and Baltimore road, reports that he uses cast-iron, and finds it not so liable to slide the wheels as wrought-iron or wood.

Olney L. Smith, of Providence and Worcester Railroad, after a long experience, finds that cast-iron has proved the best material, he having previously used wrought-iron, wood, and leather.

S. D. Danfield, of Baltimore Central Railroad, reports the use of cast-iron shoes of the Bing patent pattern ; it does well, and he is about trying some of the McHaffie direct steel cast shoes.

J. B. Gayle, of the Raleigh and Gaston Railroad, uses oak-wood exclusively, and it gives general satisfaction.

Sanford Keeler, of Flint and Père Marquette Railroad, says he finds cast-iron expensive on account of wearing away so fast.

F. Leppens, of the New-York, New-Haven, and Hartford Railroad, finds wrought-iron will out-wear six times its weight of cast-iron ; taking a shoe 3 x ¾ weighing 10 pounds, and he has found it will run 33,000 miles, making 13,772 stops.

A. Gleason, of the Old Colony and Newport Railroad, reports wrought-iron shoes working well on cast-iron wheels, and more durable than cast-iron shoes, but that wrought-iron shoes will not work on steel tires.

John Marquis, of the Pittsburg, Port Wayne, and Chicago Railroad, reports the use of some malleable iron shoes, and thinks they are the most economical, and finds from the tests he has made that the malleable iron shoes will wear three times as long as ordinary cast-iron, and are only half the weight.

Ambrose Ward, of the Pennsylvania Railroad, reports the use of malleable and cast-iron, finding the malleable iron more durable, if properly annealed.

R. S. Ramsey, of the Pennsylvania Railroad, reports he is replacing as fast as worn out all shoes with malleable iron, they being only half the weight of cast-iron, and wear three times as long, and stop trains as quickly.

B. K. Verbryck, of the Chicago, Rock Island, and Pacific Railroad, reports he has tried a few malleable iron shoes, but can not as yet tell much about them ; so far, they appear to wear twice as long as cast-iron.

B. P. Lamason, of the Empire Line, uses cast and malleable iron, with a decided preference for the malleable, as it has less weight and gives greater service than cast-iron.

C. Woods, of the Union Line, says he saves 160 pounds of dead-weight per car by using malleable iron shoes instead of cast-iron as formerly, and finds the malleable wears three times as long as the cast-iron.

John Kirby, of the Lake Shore and Michigan Southern Railroad, reports cast-iron doing very well, but McConway, Forley & Co., of Pittsburg, make brake-shoes of malleable iron or semi-steel that wear twice as long as cast-iron, and only half the weight.

W. H. H. Allison, of the Cincinnati, Hamilton and Dayton Railroad, reports the use of cast and malleable iron, and his experience is favorable to malleable iron if made properly.

I. W. Van Houten, of the Pennsylvania Railroad, says malleable iron shoes are the best and cheapest that can be made.

Q. 3. Do you use brakes on both trucks ?

Eighteen members report the use of brakes on both trucks of their freight and passenger cars ; 49 report the use of brakes on both trucks of passenger-cars, and on one truck only of their freight-cars.

Q. 4. Can the brakes be applied from either end of the car ?

Forty-two members report that the brakes can be applied from either end ; 23 report that they can be applied at one end only.

Q. 5. What is your method of equalizing the pressure on the wheels when the brakes are hung on both trucks ?

Nine report that they use the Stephens connection, 42 use the Hodge connection, 1 the Loughridge connection, and 4 special designs.

Q. 6. Do you use a power-brake that gives the engineer control of the train ?

Fifty report the use of such a brake, and 10 report that they do not use it.

Q. 7. By what name is it known ?

Thirty-eight use the Westinghouse air-brake, 8 use Smith's Vacuum brake, 3 Creamer's safety-brake, and 1 Thompson's steam-brake.

Q. 8. Is it reliable in all kinds of temperature ?

Thirty-four report the Westinghouse to be reliable, and 3 do not find it so ; 7 report the use of Smith's Vacuum, and find it reliable, and 2 report Creamer's reliable.

Q. 9. What method have you of releasing your brakes after they are applied ?

The replies to the method of releasing brakes were prompted to your committee from the fact that last year's report disclosed that there was trouble reported in the release of the Westinghouse Air-Brake, but we find this has been overcome by the improvements perfected by the Westinghouse Air-Brake Co. However, as a matter of interest, we find that every company reporting use the same plan—namely, spiral-shaped springs from the truck end to the brake-beam. The Smith and Creamer brakes require only this assistance for prompt release, while the Westinghouse has additional provision in the shape of two spiral springs attached to their levers underneath the center of the car.

Q. 10. In what time and distance will it stop a train of ten passenger-cars running at a speed of 25 miles an hour ?

We find some few replies to this question, but as so few of the members have witnessed any trials that they have kept any record of, we have deemed it proper to pass this by, as we have not received replies enough to repay us for their consideration.

Q. 11. What is your experience as to its working and economy ?

Thirty-two report satisfactory replies as to the Westinghouse, 7 as to the Vacuum, and 3 as to Creamer's.

Q. 12. Do you think a brake should be such as to be automatically applied in case of the parting of the train, running off the track, rupture of connections, or from any similar cause ?

Forty-six report affirmatively and 15 in the negative.

Q. 13. Do you know of any such brake ?

Thirty-seven report yes and 24 no.

Q. 14. By what name is it known ?

Thirty name the Westinghouse, 7 Creamer, and 1 Olmstead's Electric.

In preparing a summary of the information above conveyed, your committee desire to call attention to some of the points which seem to favor the malleable iron brake-shoe as being superior to those made of other materials. We find that while a majority report in favor of cast-iron, and a few in favor of wrought-iron, all who give an opinion in regard to malleable iron have done so after more or less testing and experience, with a favorable result in every instance ; and as this is a matter involving a large expenditure in the maintenance of rolling-stock, we bespeak for it a due degree of consideration at your hands. As the reports concur in representing the malleable shoe as outwearing several times any other material, also as being considerably lighter in weight, and stopping a train as quickly, it is evident that a very important saving can be made by its general adoption.

It seems to be almost the unanimous opinion, as indicated in the reports to your committee, that brakes should be applied to both trucks of passenger-cars, and to one truck of freight-cars. A large majority also favor the placing of brakes so they can be applied from either end of the car. The Hodge connection is used by three-fourths of the members who have made replies, as their method of equalizing the pressure on the wheels.

About five-sixths of the replies report the use of a power-brake which gives the engineer control of the train. We also find that a majority use the Westinghouse Air-Brake. This being the first power-brake introduced, it has in consequence been adopted to a greater extent than some of the appliances of a later date. It is reported as being reliable in a large majority of cases—34 to 3. All who report upon the Smith and Creamer brakes represent them as being reliable. A majority favor an automatic brake, but in regard to automatic action in case of the parting of the train, 37 report that they know of such a brake, and 24 that they do not ; 30 name the Westinghouse, 7 the Creamer, and one the Olmstead Electric.

In concluding this part of our report, we give the leading opinions expressed in regard to the several power-brakes : J. A. Read, of the N. Y. and O. M.,

has knowledge of two automatic brakes, descriptions of which he will send to the convention: R. Reniff, of the Chicago and Alton, uses the Westinghouse and finds it economical; W. W. Wilcox, of the Chicago, Burlington, and Quincy, knows of no brake equal to the Westinghouse in working and economy; J. D. McIlwain, of the Lake Shore and Tusc. Valley, uses the Westinghouse and is satisfied, but thinks there are more economical power-brakes; R. S. Ramsey, of the Pennsylvania Road, uses the Westinghouse, and finds a great saving in wheels and general repairs, especially on trucks and drafts; Israel Lee, of the Pittsburg, Fort Wayne, and Chicago, reports very light repairs from the use of the Westinghouse for more than two years on all passenger-cars, and that it is in other respects satisfactory; John Kirby, of the Lake Shore and Michigan Southern, has had no trouble with the Westinghouse in extreme cold weather; B. K. Verbryck, of the Chicago, Rock Island, and Pacific, finds the Westinghouse relieves too slowly in cold weather when the oil in the cylinders is liable to chill; Jacob Huy, of the Mobile and Ohio, says that with the late improvements, the Westinghouse is reliable in all temperatures; D. F. Wilson, of the Milwaukee and St. Paul, says the Westinghouse is reliable in all temperatures, if well looked after, but otherwise useless; Hugh Gray, of the Chicago and North-western, has used the Westinghouse two winters, and has found it reliable at all times; A. J. Allen, of the Indiana, Bloomington, and Western, finds the Westinghouse reliable in all temperatures, but that it requires closer attention in cold weather than in warm; Sanford Keeler, of the Flint and Père Marquette, thinks the Westinghouse will save its entire cost in two years in the saving of wheels; the Ohio and Mississippi (Cincinnati and St. Louis) use the Westinghouse and Thompson brakes, both of which work well, although the latter costs much more for repairs than the former; A. Steinbach, of the Philadelphia and Reading, uses the Westinghouse and the Smith vacuum brakes, and reports the former scarcely ever in order; James Leppens, of the New-York, New-Haven, and Hartford, says the Westinghouse is more expensive in wheels and shoes than hand-brakes, but more reliable; J. M. Foss, Central of Vermont, reports the Westinghouse as working well, and says no road can afford to be without it; Geo. Helfrich, of the Louisville, N. Albany and Chicago, uses the Westinghouse, but finds it expensive and not economical; W. T. Worth, of the Philadelphia, Wilmington, and Baltimore, uses the Smith Vacuum brake, and finds it entirely reliable, satisfactory and economical, as compared with other brakes; D. C. Richardson, of the Boston and Maine, finds the Smith Vacuum brake saves wheels and does not require so many brakesmen; Geo. Hackett, of the Central of New-Jersey, reports using the Vacuum brake for 18 months and no expense; W. E. Chamberlain, of the Boston and Albany, says the Westinghouse is expensive in the matter of repairs, while the Vacuum costs not a cent; S. A. Davis, of the Boston, Lowell, and Nashua, finds the Smith Vacuum brake reliable at all times; V. D. Perry, of the Hartford, Providence, and Fishkill, uses the Smith Vacuum, and thinks it the most reliable and economical power-brake yet introduced, as there is no pump to get out of order.

We now proceed to the consideration of what we deem a perfect power-brake, meeting all the requirements of such an appliance.

1st. Such a brake should be easy of application and easily and quickly released. 2d. It should have a maximum of power at a minimum cost of equipment. 3d. The greatest possible amount of service, with the least possible cost for repairs. 4th. Facility of operation by the engineer, conductor, or other train-hands, without liability of application by passengers or other unauthorized persons. 5th. An automatic attachment that will provide for an instant application of the brakes in case of the parting of the train.

Due regard being paid to these requirements, we would recommend that each member should keep a memoranda of an average train, giving the mileage, number of stops, general character of the road, name of brake used, and the monthly cost for repairs, say for six months.

After examining carefully the reports received as to the working of the several brakes, we find that, as far as filling the requirements of a perfect power-brake, the ones reported on stand as follows:

The Westinghouse air and automatic brake seems to be easy of application, but several members report adversely as to its ease of release. As to the second requirement, it has a maximum of power, but costs more for first equipment than some of the others; it seems to give very general satisfaction as to the amount of service rendered, and costs but a nominal sum to keep in repair. The facility of application by the engineer or train-hands is provided for, but in such a manner as to render it liable to be applied by unauthorized persons. It seems to fill the fifth requirement perfectly.

With respect to the Smith Vacuum brake, the majority of the members who are using and are familiar with the use of this brake report favorably as to its ease of application and quick release. We find it has the power requisite for a train-brake, and costs less for first equipment than some of the others. It has given perfect satisfaction to every one who reports its use, with a small cost for repairs, as there is nothing liable to get out of repair through wear, except the coupling. It has no automatic attachment. It can be applied only by the engineer, and has no provision for application in the case of a parting of the train or derailment.

The Creamer brake is essentially a safety-brake, with no indorsement for general use as a station-brake, and we have no data for comparison as to first cost or repairs. If set, it will apply automatically in case of the parting of a train. It is reported by members using it as generally reliable.

The Thompson steam brake. We have received no description of this brake, and it is reported by one member as being more expensive in repairs than others.

There are a number of other power-brakes to which our attention has been called, but we have no definite knowledge as to their working, not having received any description of them.

Appended to this report will be found papers and drawings from the Westinghouse Air-Brake Co., Loughridge Brake Co., Smith Vacuum Brake Co., Electric Brake Co., W. G. Creamer, R. J. Wilson, and Karl Exter, all of which describe very fully and explain very accurately the working of their designs. Also a full description and drawing of the Hodgkins brake attachment kindly furnished by James M. Foss, Esq., of the Vermont Central Railroad.

Your committee, on their return from the Boston convention last year, requested Morris Sellers, Esq., of the Westinghouse Air-Brake Co., to make a trial of stops on the Old Colony and Newport Railroad, over which many of the members of the convention were passing, and which was using the brake of said company. Permission to do so was granted. The train consisted of 8 cars drawn by engine "Neponset," C. T. Haskins, engineer. Mr. Joseph Jones, of the New-York Central and Hudson River Railroad, was stationed on the engine, and Mr. Hugh Gray, of the Chicago and Northwestern, did the measuring. The result was as follows:

1st trial, Coal Mine Station, R. I. Train running at a speed of 25 miles per hour, down grade. Stopped in 33 seconds, distance 888 feet, 130 lbs. steam, 95 lbs. air.

2d trial, Corey's Lane Station, R. I. Down grade. Train running at a speed of 25 miles per hour. Stopped in 30 seconds, distance 924 feet, 130 lbs. steam, 90 lbs. air.

3d trial, Portsmouth Grove Station, R. I. Down grade of 30 feet to the mile approaching a curve on which the engine and one car rested at the final stop; train running at a speed of 28 miles an hour. Stopped in 27 seconds, having run a distance of 696 feet, 128 lbs. steam, 90 lbs. air.

It is due to the Westinghouse Air-Brake Company to state that the trial was made without any previous notice, taking this train just as we found it, not knowing whether it was in repair or not, consequently an allowance should be made over published tests of trains that have done better, and which were nicely adjusted and inspected before the trials were made.

In closing this, our second report, your committee would respectfully suggest to the Association the great importance of the subject of power-brakes, not only regarding the safety of life, but as reducing the expense of maintenance of rolling-stock. Another important matter has suggested itself to the committee—namely, that of the interchange of cars, and the importance of having a uniform brake. This is a matter we think should receive some attention from the Association at this time.

The committee, in submitting their report, would take occasion to thank those members who have kindly assisted the committee by sending in prompt replies, with the hope that an increased interest will be manifested next year in sending full replies to the committee; also would say to those who have not answered the interrogatories, that we trust they will see the importance of responding in future, in order that the committee may present a full and intelligent report next year.

The committee deem the subject of safety-brakes one of great importance, as not only involving the safety of property, but the preservation of human life. Swiftness of travel is one of the great features of the age in which we live, but it carries with it a problem of vast consequence, that of an increase of safety as well. The subject receives in a hundred ways careful and intelligent attention. Signal-stations, telegraph-wires, and a vast multiplicity of special machinery, attest the interest that is taken in the question of safety as applied to railway travel. Of the various inventions brought forward for acceptance, however, none are so important as the safety-brake. The interest in this subject has not been confined to railway men, but the general public has therein a deep interest in the means made use of to insure safety to travel. A little more than a year ago, a bill was introduced in Congress requiring all companies to have their roads equipped with power-brakes by January 1st, 1874; this bill required that these brakes should be operated from the locomotive, as danger is most speedily discovered from that point. The bill did not pass, as the time had not come, the entire system being one of experiment and trial; but the introduction of such a bill marks the interest felt in the question. The records of patents in this country and England show that safety-brakes date back as far as 1840, the Hydrostatic being patented as far back as 1835. In this country, the first safety-brake patent is dated November 12th, 1847, and was issued to George E. Sellers. From that date to the close of 1872, 58 patents were issued to various inventors. These brakes differ in many essential particulars, but are alike in this, that they may be operated from the locomotive.

The theory on which this application of brake-power rests has been the subject of much discussion, and the sphere of inventive experiment. That the engineer should be able to apply the full brake-power at command for the stoppage of a train is admitted, but this contemplates provision for but a single form of danger—that which is discoverable before it is closely approached. There are, however, other forms, such as the breaking apart of cars, fire, broken wheels or axles, etc. A car connected with a train on the Pennsylvania R.R. separated from the balance of the train, at night; the cars attached to the engine were borne rapidly ahead for more than a mile, before the break was discovered; the train was stopped, when the separated car struck the train; a down-grade explains the cause of this peculiar accident. To provide against such difficulties, automatic brakes are quite as indispensable as those which can be applied from the locomotive.

It does not come within the province of this report to examine the peculiarities or the merits or demerits of safety-brakes now in use. The object had in view, in issuing the circular, was to reflect actual experience in this direction; this your committee deems of more importance than *ex parte* opinions. The analysis of those submitted is very suggestive, and will be of more value, and is quite as impartial as any thing we can offer.

That perfection is yet reached, your committee does not assume. Valuable practical results have been accomplished, but these only indicate what yet remains to be accomplished. If to the element of safety involved in the use of power-brakes, we add economy, and time, and money, certainty in handling the train as regards stoppages, we have a fair idea of the value of these inventions; yet the question arises, whether improvement is not possible in point of simplicity, cheapness, certainty of action, automatic action, and durability. These points are offered, not as reflecting on systems already in use, but as suggesting whether greater advantages are not attainable.

Your committee is gratified to report that the inventors already in the field are alive to the importance of these questions, and are devoting their energies to reach the desired goal. In conclusion, we would urge that the entire subject of safety-brakes be thoroughly discussed, to the end that all the light to be derived from experience and observation may be rendered available in devising and applying improvements yet to be made; and that such suggestions be made as may be deemed valuable in directing the aims of inventors.

Respectfully submitted,

R. S. Ramsey,
Hugh Gray,
Joseph Jones,
Committee.

The quadruple tracks of the New-York Central and Hudson River Railroad from Albany to Buffalo are being laid with considerable rapidity. The right of way has been purchased, the road-bed graded, and the bulk of the entire work performed, while at the same time the corporation has carried forward the business incidental to the line. The four tracks will be completed and placed in running order the coming winter as far west as Rochester.

It is said that the Baltimore and Ohio Railroad will construct one hundred new cars for its western extension, this season. The main line of this road will be completed to Defiance, Ohio, by July, and forty miles eastward from Chicago by that time. It is intended to have the road finished and running in Chicago by the end of the year.

Todd's Patent Car-Coupler.

THE engravings represent this coupler with a recent improvement, which consists of a chamber or pocket in which an extra link is always carried, so as to take the place of the one in use in case of breakage. Fig. 1 is a longitudinal section; Fig. 2 a side view; Fig. 3 a horizontal section, and Fig. 4 a plan of a car draw-head. A, Fig. 1, is an automatic hook or latch, which is forced upward by the link C as it passes under it, when the hook falls to its place within the link, and couples the cars. E is the reserved or extra link secured within the chamber D, with no liability of being lost or stolen, it being held in its place by the lug F. The uncoupling is easily effected by raising the hook, which has a small eye on the top to which a chain or lever is attached for the purpose. The hook is made of steel, and the draw-head of cast-iron. The construction in other respects is clearly shown in the cuts, and requires no description. It is said to be simple, safe, sure, and economical, and will couple readily with any ordinary draw-bar, without the necessity of going between the cars.

We have inspected a working model of this invention, and so far as we can judge from its operation, it will do all that is claimed for it. It has also been thoroughly tested by the Boston and Albany Railroad, and has given such entire satisfaction that it has been adopted by the managers of the road, and is now in use on a large number of through stock-cars. The inventor is Mr. William Todd, of Boston, Mass. One or more sets of the castings will be furnished gratuitously to roads desiring to test it, by applying to Williams, Page & Co., of Boston, whose advertisement will be found on another page, or to Vose, Dinsmore & Co., New-York.

FIG. 3

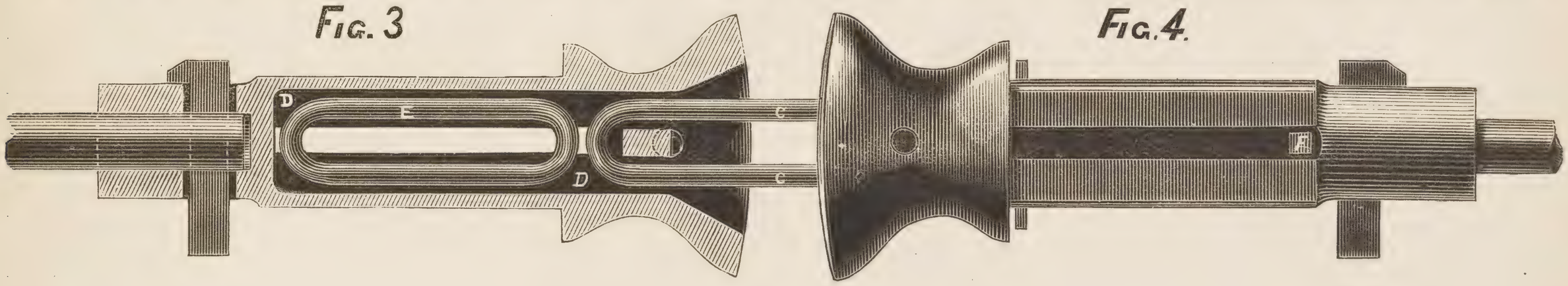

FIG. 4.

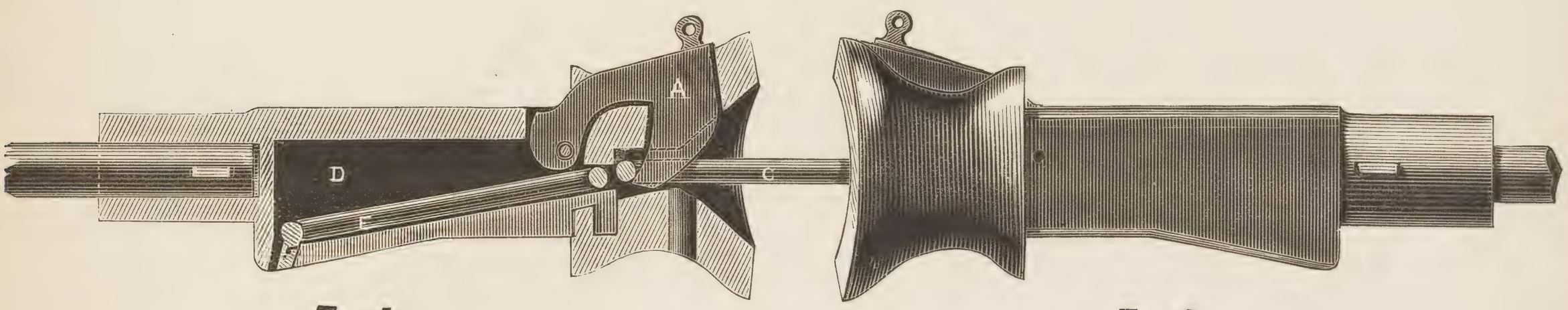

FIG. 1.

FIG 2.

The Late John Edgar Thomson.

THE July number of *The Penn Monthly* has an interesting article upon the character and career of this distinguished railway official, from which we copy the following:

"At the age of nineteen, Mr. Thomson was attached to the Philadelphia and Columbia Railroad, then an important line, and three years afterward, in 1830, he was transferred to the Camden and Amboy Railroad, which was of about the same rank as the other. In 1832 he went to Europe to gain a professional culture which could only be obtained there; and in 1836 he took charge of the Georgia Central Railroad, the longest road then in this country. His life hitherto had been very hard work upon small pay, and he had not yet known more than the simplest of luxuries or comforts. As he himself said, he had never up to that time been given any place for which he had applied: his rewards came when not looked for. He had stepped, however, upon that which was by no means the lowest round of the ladder, and was now certain of a recognition of his abilities. He said with honorable pride that with those who knew him he was as much respected at twenty-four as he ever was at the height of his reputation.

"In Georgia, he laid the foundation of his future career by that system of work which in later days raised him to eminence—a far-sightedness and boldness in his original conception, joined with a scrupulous prudence in each step taken. In the course of his life, he three times brought a great railroad through a general financial crisis—the Georgia Central through that of 1837, the Pennsylvania, and the Pittsburg, Fort Wayne, and Chicago Railroads through that of 1857, and the Pennsylvania Railroad, with all its connecting lines, through that of 1873. He laid out the town of Atlanta, now the capital of Georgia, and is still remembered in that State, though it is now nearly thirty years ago, with the most thorough respect and regard. He left the Georgia Central Railroad in admirable order, when in 1847 he was called to be the chief engineer of the Pennsylvania Railroad, which had just been chartered; the transportation system of Pennsylvania then consisting of a railroad from Philadelphia to Columbia, another one from Lancaster to Harrisburg, a canal route from Columbia to Hollidaysburg, at the foot of the Alleghanies, the Portage Railroad over the Alleghanies, and on the other side a canal from Johnstown to Pittsburg; the quickest time from Philadelphia to Pittsburg being 91 hours. The great problem at that moment to be met was the passage of the Alleghanies; the Portage Railroad, as it was called, with ten inclined planes up the side of the mountain, and stationary engines at different points, had been inadequate to compete with the New-York and Baltimore lines, which were, or were about to become continuous railroads without any such inclined planes—and the question before the engineering world was whether or not there was any better substitute. Mr. Thomson said unhesitatingly that by curves the ascent could be made, and with a short tunnel at the top, the monstrous obstacle be conquered. The achievement of the 'Horse-Shoe' beyond Altoona was the crown of Mr. Thomson's professional career; for from that time he ceased to be a practical engineer, and to railway administration and finance the rest of his life was devoted. In 1852, while at his work on the mountains, he was elected President of the Pennsylvania Railroad, and with some reluctance accepted the position, being of the opinion that greater reputation and wealth could have been reached by him in the line of his first occupation.

"How under Mr. Thomson's rule the Pennsylvania Railroad has grown to what it is now, connecting New-York with Chicago and with St. Louis, having its termini upon the Atlantic seaboard and upon the great lakes, and controlling as far as New-Orleans and into Texas, will better be given by Mr. Cuyler, who, at the request of the Board of Directors, is to write the history of Mr. Thomson's public career. It will be for us to tell of his personal life; to show what he was in his home and to those who knew him well. He was a singularly silent man, this characteristic amounting to an idiosyncrasy, but he would at times speak so freely as to astound his listeners, perhaps the last persons to expect his confidence; and from the trusted companion of twenty years of his life there was probably little held back. His great reserve and a certain shyness made him appear, and perhaps sometimes be, brusque to those who knew him but slightly; for those whom he disliked or disapproved of he could never have been pleasant to meet. His methodical way of forming his opinions made him easily open to conviction at the outset, but almost impossible to move afterward. He was always conservative in his feelings, especially in later life, but he never lost any of that breadth of comprehension with which he regarded railroad enterprises; he said of the two unfinished Pacific Railroads, which since last autumn so few have had the courage to defend, that they were both good roads if not recklessly pushed."

THE newly chosen directory of the Erie Railway includes Thomas A. Scott, of the Pennsylvania Railroad; John King Jr., Vice-President of the Baltimore and Ohio; Hugh J. Jewett, heretofore general manager of the Pittsburg, Cincinnati, and St. Louis; Henry G. Stebbins and Marshall O. Roberts, of this city; and Suydam Grant, of the Grant Locomotive Works. The new board elected Hugh J. Jewett, President; William P. Shearman, Treasurer, and A. R. McDonough, Secretary.

THE Lancashire and Yorkshire Railway Company of England has adopted a new invention known as the Aere steam-engine, the object of which is saving of coal. It is constructed in such a manner as to promote the more rapid and easy generation of steam by the introduction of heated air directly into the mass of water within the boiler, and shows a saving of from 12½ to 15 per cent of coal. It is applicable not only to locomotive but also to stationary engines.

The Relation of Railway Rolling-Stock to the Rails.

BY JAMES M. BLANCHARD.

THE heading of this article implies that there is a sense in which rolling-stock is related to rails, and hence the necessity of endeavoring to ascertain the nature of such relation. If we inquire what it is, the obvious reply will be that the rails furnish the way upon which the wheels run; but the further question arises as to whether there are not other important relations existing besides this. It must, I think, be admitted that there are; for it is a fact, whatever may be said to the contrary, that with a given weight and quality of rail, its durability is dependent upon the character of the rolling-stock—its weight when loaded, and the speed with which it is run. This being so, it becomes a matter of vital importance to know what particular quality or feature of the rolling-stock affects the rails most seriously, and also the nature of such effect.

I have shown in a former article that it is not wear, properly speaking, which destroys the rails of a road, but that it is lamination, and that that is caused by pounding, or, more properly speaking, by a succession of blows given by the wheels to the rails. I am quite well aware that it is of but little use to state a fact with which all are familiar, without at the same time stating a remedy for the difficulties which the fact demonstrates. Let us therefore look a little into the realms of science and mechanics, and see if we can not find a strictly philosophical as well as mechanical reason for the assertion that the destruction of rails is caused mainly by pounding. It is a philosophical fact known to all students in matters of this kind, that when two bodies or substances are brought in contact, the greatest injury is done to the one which has the least degree of density or solidity; and hence the artisan, when he desires to make an impression upon a piece of metal, selects for his hammer a kind of metal which is of greater density than that upon which it is to be used, and for that reason, all the hammers found in our shops are made of steel, and are hardened so they will make an impression upon other metals, instead of having the impression made upon them. The blacksmith who should select a piece of wood or lead out of which to form his sledge would be regarded as lacking ordinary intelligence, or as insane; and yet such a proceeding would be quite as consistent as to claim that chilled iron is a proper material for that part of a wheel which comes in contact with the rails.

Let it be borne in mind that every engine or car-wheel with a chilled tread, which passes over our railways, is a hardened hammer, striking a blow upon the rails wherever their surface is the least uneven; and especially at the joints where the wheel jumps from one rail to the other. When the blacksmith wishes the metal he is hammering to receive the smallest change of form or defacement, he invariably uses a kind of metal for his hammer which is not so hard as that he wishes to strike; and the logical deduction seems to follow that if we would save our rails from destruction, we must use a metal for wheels of less density than that of the rails. If the rails are to be of steel, then clearly the wheels should be shod with steel; but if of iron, then the surfaces of the wheels which come in contact therewith should be of the same, and not of a material many times harder. I am not unmindful that the rails, imperfectly laid as they are, and owing to the fact that they are in a state of rest, and have all the weight of the rolling stock to bear, will, as a matter of course, suffer most from the blow, but this certainly does not change the fact that the harder the hammer the greater the injury.

Our whole railroad fraternity are just now exercised over the question of the economy of using steel rails, and the question very naturally arises, will they prove a success; or, in other words, will they afford a remedy for the evils complained of? It is a law of physical forces that a body of a given weight, in falling a given distance, will produce a certain calculable result, and it is equally true that the character of that result will be to a great extent modified by the density of the substance with which it comes in contact. If the falling body be of iron, and the substance against which it strikes be wood, we shall see one kind of result; but if both substances be iron, another and a very different result would follow. In the first case, there would be a yielding of the wood, and consequently the time for arresting the motion of the falling body would be prolonged just to the extent of the yielding of the particles, and hence the disintegrating action upon both would be lessened. If now we suppose that both bodies are of iron or steel, then there will be far less yielding of the fixed body, and the shock or disintegrating effect upon both will be greater. In applying this theory, or rather these facts, to the case under consideration, we shall find the same law operating as in the supposed case, which is that a given weight falling a given distance strikes with a given force, and produces a result the character of which will be modified by the character of the wheels and rails. If the surfaces of the wheels are of a material which is much more dense or harder than the rails, the disintegrating effect will be greatest upon the rails and their supports; but if, on the other hand, the greater density or hardness is in the rails, the damaging effect will be upon the wheels, and through them upon the other parts of the engine or car. I presume I shall be confronted with the assertion that whether the rails are of steel or of iron, they rest upon sleepers or ties of wood, and that consequently the effect in either case will be about the same. But is this true? Suppose the rail was suspended in air; would that fact change the other fact—namely, that the concussion would depend upon the character of the body striking it, or *vice versa?* Clearly not. The advocates for the use of steel rails, in connection with wrought-iron tires, will perhaps say that all this sounds like a very fine-spun theory, but if this were granted, the fact remains that it is true, practically as well as theoretically. What then shall be done? Shall the use of steel rails be condemned? Not necessarily, but they should be used in connection with steel-faced wheels, for the reason that when thus used, the greatest economic result will be attained.

I have not at hand the data showing the difference per mile in the cost of steel and iron rails, but as is well known, the former costs considerably more; and in this connection, it is pertinent to inquire if this difference were expended in improving the quality of iron rails and also of rail-joints, whether such rails would not be found to be as economical as steel? This question can hardly be answered from data or experience, for the reason that, so far as the writer is aware, the necessary tests have never been made. We can, therefore, only look to the probabilities in the case, and try to ascertain what they are, keeping in mind that the reason urged for the use of steel rails is not that iron ones have not the requisite density and strength to carry the loads put upon them, but that they are too easily disintegrated and destroyed. The question then is, can this disintegration and consequent lamination and destruction be prevented to such an extent as to make the iron rails equal in point of economy with steel ones? I am in possession of a letter written to me by an engineer of standing and character, and a gentleman of large experience in the construction and operation of railroads, in which he uses the following language: "In Europe and in America, untold millions of dollars have been lost to the railroads by the pounding process upon the rails, and yet the pounding goes on." To a person who has been familiar with the history of our railroads, the above will not be deemed an extravagant statement.

I come now to speak of the cause or causes of the destruction referred to, and in doing this I shall consider only those which inhere in the track of the road, premising that there are others which, in writing an exhaustive treatise upon this subject, should be referred to and explained.

It may be stated as a general proposition, that the two principal causes of disintegration in iron rails are imperfect material and workmanship in their construction, and imperfect jointing of their ends. The remedy for the first of these difficulties will not be discussed here, as that would very properly form the subject matter for an entire article. The second difficulty is an important one, and may properly be spoken of in this connection. It has been shown in a former article that most of the pounding process of a railroad-train has its origin at the joints of the rails. If such joints are unnecessarily defective, can such defects be remedied? Rail-joints are usually made with a view of forming a solid resting-place for the ends of the rails, and in doing this, an anvil-block is formed upon which to pound the ends as each wheel of a train passes over them; and the very solidity thus sought to be produced is the exact opposite of the feature required for the preservation of the rail. If there is any point in a railroad where elasticity should be provided for, it is at the joints of the rails. It is not sufficient, however, that elasticity be provided at these points, for if the surfaces of the rails are allowed to vary the one from the other, either vertically or longitudinally, the elasticity will become an element of destruction instead of protection to the ends of the rails.

The requirements then in a perfect rail-joint are ability to keep the ends of the rail in perfect alignment, and at the same time provide for a slight yielding of their ends vertically as the wheels pass over them, without permitting any perceptible longitudinal movement. These requirements can never be met so long as the present practice prevails of placing ties or other bearings under the ends of the rails, because of the fact that when thus placed, they must be of such a degree of solidity as to prevent the surface of the track from dropping down at such points, and when thus made, they invariably afford the very means required for the most effective destructive action of the wheels in passing them. In view of the above facts, it would seem that the proper method of making joints in rails would be to form a tight-fitting sleeve which shall cover all parts of the rail except the tread, and insert the ends of such rails therein, the sleeve being of such a length as may be found most effective, there being two ties used for making the joint instead of one, as at present, and they being placed at or near the ends of the sleeve, but in no case under the ends of the rails.

Such a sleeve, it is believed, would preserve the alignment of the rails at their ends, while, in consequence of the fact that there would be no tie directly under the joint, the required elasticity would be secured to prevent lamination.

The Great Bridge at St. Louis.

THIS important structure was formally opened on the 4th of July. The river is spanned by three arches, each formed with four ribbed arches of cast steel. The length of the central span is 520 feet, and the side ones 500 feet each in the clear. The two river piers are respectively 194 and 165 feet in height from their foundations. The two abutments are very massive, one containing 25,000 and the other 45,000 tons of stone. The upper roadway is 34 feet wide between the foot-walks, which are 9 feet wide. The railway passages below the carriage-way are each 14 feet 6 inches in the clear, and 18 feet high, and are carried over the wharves on each side of the river on five stone arches, each 26 feet wide, inclosed throughout the distance by a cut-stone arcade of 20 arches, supporting the upper roadway, and are carried into the tunnel on brick arches. On the Illinois side, the railways reach the level of the East St. Louis Railways by a descending grade of 1½ feet in 100 for a distance of 3000 feet. The carriage-road at the eastern end descends with a grade of 4 feet in 100, and on the Missouri side the grade is nearly level. The marvels of this bridge are the extraordinary breadth of span and great depth of foundation, and that it accommodates two

double tracks of steam-railways, street-railways, and all kinds of vehicles, as well as foot-passengers.

The total length of the bridge proper is 2107 feet; from centre to centre of east and west abutments, 1627 feet; clear height of centre of middle span above high-water mark, 55 feet; same of side-spans, 50 feet; width of roadway, 33 feet; footwalks, each, 9 feet; top of bridge, 54 feet.

The formal test is described as follows: Seven locomotives were placed upon one track of each span. This produced a deflection of 2½ inches on center span and 2⅛ inches on each side span. Seven locomotives were then placed on each track of the west approach, and both trains of locomotives, fourteen in all, were moved out abreast and simultaneously over each one of the three spans. The locomotives weighed from 35 to 51 tons, averaging 40 tons each, making 560 tons in all. The two trains thus formed were stopped on each span, and the effects of this load carefully noted. The deflection of the middle span was 2½ inches; of each side span, 3 inches. The two trains moving abreast upon each arch was the severest possible test to produce distortion of the curve of each arch. Ten locomotives were then coupled together, and these were run over each track on each side of each arch of the entire bridge, covering the entire track of each span, and throwing the whole weight of the train, 400 tons, on one side of each span. This test was applied to each side of the bridge, and produced the severest twisting strain to which each arch can be subjected. The vertical deflection produced by this test on the centre span was 2½ inches. The locomotives thus coupled were run at a speed of ten miles per hour. The local traffic on the upper roadway of the bridge was uninterrupted during the progress of the tests. Various other observations in detail were made, noting the effects of the load on the arches as it entered upon and left the different spans, but this possesses no special interest to the general public. The result of the tests agreed almost exactly with the theoretical computations previously made, and the whole trial proved eminently satisfactory. The instruments failed to detect any side motion whatever during the tests.

The Connecticut River Railroad Company has been experimenting with an arrangement intended to do away with the sharp, hissing noise attending the escape of steam from the Vacuum Brake, and to which great objection is made. The method tried is to attach a triple-box to the cab of the engine just where the pipe of the brake comes through. The steam expelled from the steam-jet enters the inner box, from which it slowly escapes into the middle one, and at last reaches the outside. The effect of this box arrangement is said to be to completely deaden the noise of putting on the brake, and the invention bids fair to be extensively adopted.

On the Atlantic and Great Western Railroad, oil-tank cars are made of three-sixteenths iron, and are sixty-one inches in diameter. The tanks hold eighty-five barrels. They resemble cylindrical boilers; are fitted with man-hole, dome, filling and draw cocks, and are strapped down to platform-cars by means of plate iron bands. The arrangement is cheap, safe, simple, and durable. Pipe lines leading from the wells to the railroad stations convey the oil, which pours directly into the tank-cars.

End-Sills.

The old style of framing the end-sills of the various classes of freight-cars is still adhered to by a large number of car-builders. This may be attributed in most cases to force of custom, or a reluctance to introduce any thing like radical innovation; but in view of the manifest defects of the old system, and the great number of accidents in the coupling of cars, it is safe to say that in no special feature of car-framing is a reform more imperatively needed than in the construction of end-sills, buffers, and the attachments thereto belonging. Such a reform has already been introduced to some extent, and its necessity admitted by all railroad mechanics who have given the subject careful attention; but to render it complete, the old style of construction should be entirely abandoned.

In order to convey a clear idea of the two methods of framing, and thus enable the reader to compare one with the other and determine their relative merits, we give herewith outline drawings of the old and new styles of end-sills and buffers, and also plans for attaching brake-stems. The cuts have reference more particularly to flat cars, but the improved plans can be applied equally well to box or stock cars.

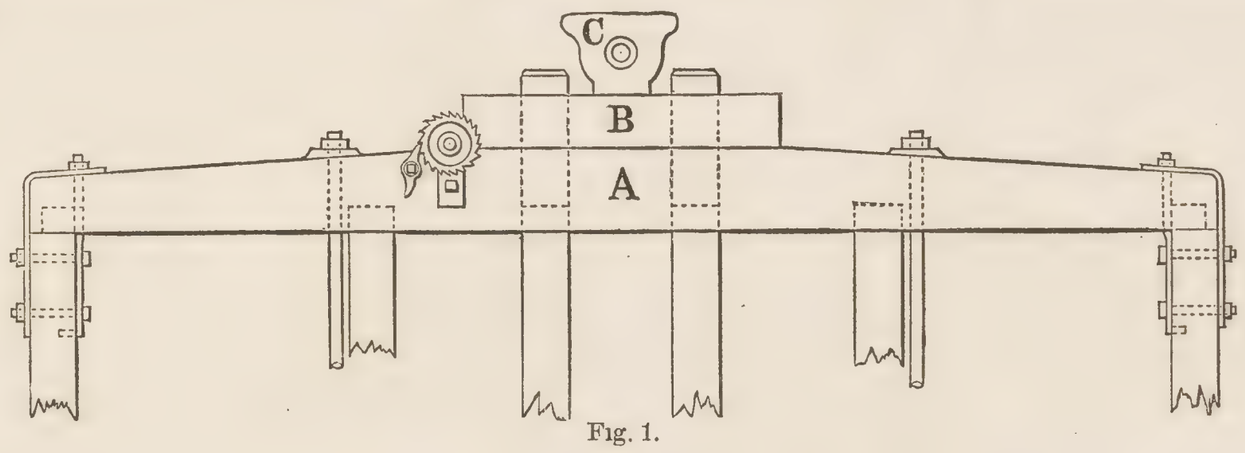

Fig. 1.

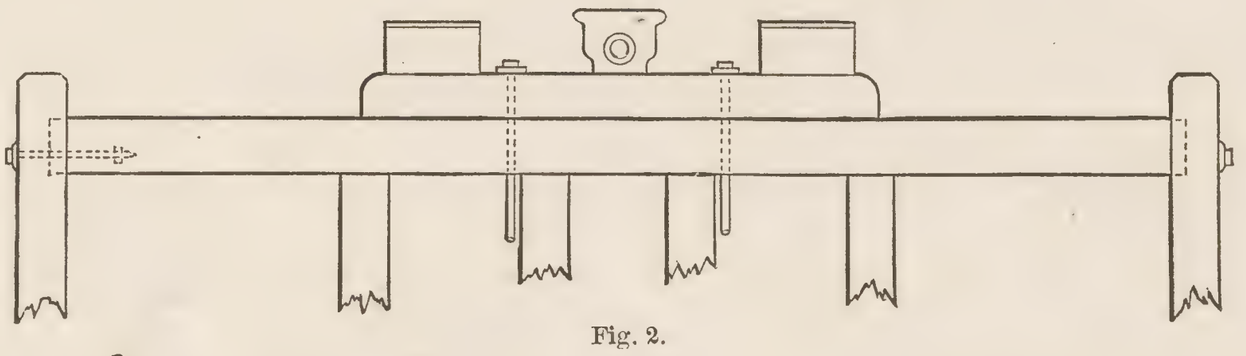

Fig. 2.

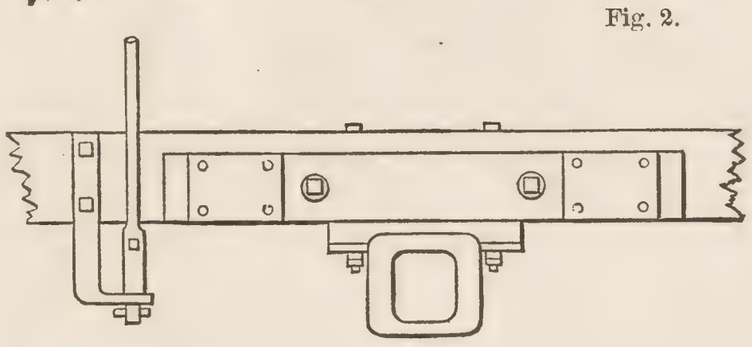

Fig. 3.

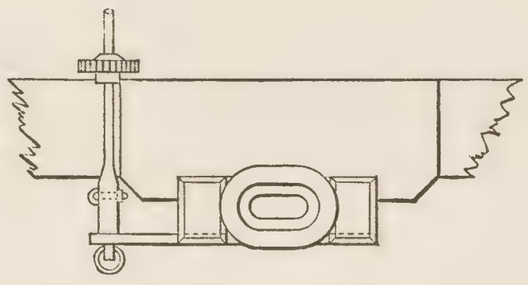

Fig. 4.

Fig. 1 represents a style of end-sill construction and attachments, which, with the exception of some minor points of difference, has been adopted by numerous roads to a greater or less extent, but not by any means universally. The end-sill A is 7 x 8 inches at the centre and each way so far as the dead-wood B reaches, the face of the sill tapering to 4½ inches at the ends. The dead-wood is 10 inches wide, 4½ thick, and 27 long. The draw-head C extends 7 inches from the dead-wood or buffer, which gives ample room for a man to stand between the cars to couple, and in case the force of contact should be so great as to break the draw-bars, a space of 9 inches is still left by the dead-woods. Very few men, however, are so stupid or reckless as to stand between cars that are likely to collide with such a force. Another feature of this style of construction is the manner in which the corners are framed. In the old style, represented by Fig. 2, the tenons are on the end-sill, the side-sills projecting forward some 3 or 4 inches, and forming a sort of trap in which an awkward or inexperienced person is very apt to be caught in passing out from between the cars. The taking out of the joint bolts is also a source of trouble in making repairs, as all car-shop hands are aware. The plan shown in Fig. 1 obviates both these difficulties. The tenon is on the side-sill. A corner-plate passes round on both sills, and is held fast by a strap-bolt passing through it and the end-sill, and two other bolts through the side-sill, as shown, the first-named bolt serving the double purpose of holding both plate and sills firmly together. In the old style (Fig. 2), if the corner get a damaging blow, the side-sill suffers most, and must either be spliced or replaced by a new one; while, with the improved plan, the end-sill is most exposed, and if injured can be more easily repaired or replaced. Spliced side-sills of the old style of framing are often to be seen, but rarely or never of the new style.

The methods of attaching brake-stems are by no means uniform. It is very evident, from practical results, that the method as shown in Fig. 3 causes a tendency, when the brake is set, to cramp and force the end-sill from its proper position, pulling it down or under, which is very objectionable. The plan as shown in Fig. 4 is an obvious improvement, the strap, 1 x 3 inches, which carries the draw-bar, being continued far enough to receive the brake-stem, and thus relieve the lower edge of the sill from the strain when the brake is set. To keep the stem to its place above, a strap ½ x 2, and 6 inches long, is let into the top of the sill, flush, and fastened with a ⅝ bolt through the sill, which relieves the end of the car from a downward pressure.

The cuts are on a scale of half an inch to a foot. The improvements which they illustrate, especially as regards end-sills, are worthy of attention as respects economy and safety. The first cost is only one element in the matter of economy, and taken alone is very apt to be fallacious. The cheapest cars are those which will require the least expenditure for future repairs, and this is to be provided for by making every part as far as possible independent of every other part, so that a local injury can be repaired without involving the whole structure. And as regards safety in the matter of coupling, let the real cause, which is the contact of the end-sills, be removed first, and then the question of automatic coupling will be in order.

Colonel H. S. McComb has been chosen President of the newNew-Orleans, St. Louis, and Chicago Railroad Company, formed by the consolidation of the Mississippi Central, and New-Orleans, Jackson and Great Northern. He was President of both companies.

A fast daylight train has been put on the Pennsylvania Railroad, from Pittsburg to New-York, which makes the run of 444 miles in 13¾ hours, the average speed being 32⅓ miles per hour. But three stops are made by this train, at Altoona, Harrisburg, and West-Philadelphia.

Fast time was recently made by the "newspaper train," which left Jersey City nearly half an hour behind time, and made it all up before reaching Trenton. This distance--a fraction less than 57 miles—was run in 59 minutes, including a stoppage of over a minute at Newark and a moderation of speed at New-Brunswick. There were some portions where the speed was more than a mile and a quarter a minute. Just beyond New-Brunswick, five miles were run in three and one half minutes, which is at the rate of nearly 86 miles an hour. About a dozen passengers enjoyed this extraordinary ride.

Practical Education.

PROFESSOR JOHN SWEET, of Cornell University, in a recent address to the students, remarked as follows, touching the comparative advantages of a technical and practical education:

"However well a minister may be versed in theology, Scripture, morals, religion, rhetoric, and elocution, unless he has the power to hold an audience, to increase his congregation, to build up his church, to loosen the purse-strings of his flock, he is not a success; he is of limited value. The first is to know, the last is to do. Many men possess the former without the latter, and doing is something accomplished without any very great stock of education. A physician, however thoroughly versed in his profession, if all his patients die, is a failure; while a quack who cures is so far a success; and in this matter of doctoring, which is especially one of the learned professions, so much depends upon practice, so much on good judgment, so much on the character of the patient and the influence of the physician in the sick-room, that the knowledge which they acquire from books is on the short end of the lever; and the more successful the physician, the nearer the fulcrum gets to the book end. A lawyer, were he an unabridged edition of Blackstone, bound in calf, if he had not the ability to convince the judge and jury, would be a failure.

"Now, if this is true with professions professedly intellectual, is it not equally true of the profession of mechanical engineering? The question is not, Do you know how a carding-machine works, but can you make a machine to trim teasel? Less likely are you to be familiar with threshing-machines, cotton-gins, locomotives, wood-working machinery, portable engines, clocks, gun-making machines, scythe-making, gimlets, fish-hook machinery, pin machinery, machines for setting carding-machine teeth, rolling-mills, hooks and eyes, blast-furnace machinery, carpet-tacks, machinist tools, nail-machines, agricultural implements, and sugar-machinery. The question is more likely to be, Have you done either, than have you seen it done, or do you know how it is done? More likely to be, can you do, than have you done? Are you to step from your graduating classes into positions of master mechanics, managing directors, superintendents, professors, or foremen? Is your sheepskin degree to be that which will enable you to get a high salary, a commanding position, a passport to every workshop you may walk up to? I hope none of you are so childish as to suppose it. Your education and the opportunities, if we can make them what I hope we can, will enable you to take leading positions; if you make the best use of your advantages, and are judicious in selecting companions, you can lead. According to the natural order of things, not more than five out of every twenty will ever be mechanical engineers, and not more than two or three out of that five will ever acquire distinction. Five, ten, fifteen years, yes, even a lifetime, is to be devoted to work, work to which our two hours a day, in comparison, is but child's play; and not only work, but study. Study with a new significance. Study to achieve, not to acquire; study to do, not to know; study to accomplish, and none of this long day, late night, temporary 'cramming' to pass.

"If you have entered on the study of mechanical engineering with a view of becoming mechanical engineers, which it is fair to presume the most of you have, and as the success of a mechanical engineer most assuredly depends upon what he can do, the question of all others which most nearly concerns you is, How can you best fit yourselves for doing? One might spend his entire freshman's year in drawing 60° angles, free hand and by drafting instruments; he might spend the three remaining three years of his college life in seeing a journeyman grind diamond-pointed lathe tools; and without practice, to which his four years' drafting and observations would add nothing, except to shorten the time required to learn, he could no more grind a tool for cutting screw threads than he could copy the statue of the Venus di Medici. No one knows how a piece of steel will 'wiggle' on a grindstone until he tries it.

"Handling a file even excellently well is an art acquired by years of practice only, and those of you who take to the glory of making a dead true surface with shadows of reluctance find even in that there is something gained by practice; or rather that, simple as it appears in itself, it is an art no more to be learned without practice than the art of writing. And further, when the time comes when you can say, 'I can do it no better than I could yesterday; I can do it as well as any man;' then, if you will count up the time it has taken you to scrape a flat surface, you will find that it falls not much short of the time which it took you to learn to write. I expect you to ask, why are we to learn to grind and file and scrape at all? Can not we be mechanical engineers without going through the drudgery of a common workman? Let us see. Did you learn to read and write and cipher before you came to the university? Yes. And what headway would you have made had you not? Do you expect to run a lathe and keep a cheap hand to grind the tools for you? Do you expect to be a judge of a workman and his work without having been a workman yourself?

"One can not take a leading position, unless in his own shop, without becoming an employé. Employers do not place their affairs in the hands of men without some evidence of competency, and inexperience in the minor affairs shows itself when one is least conscious of it."

Steam Locomotion in Streets.

A SCOTCH engineer has lately introduced a road-steamer upon the streets of Glasgow, the successful operation of which, and its absolute freedom from objection of any kind, are believed to have solved the problem of steam locomotives on common roads, which has given rise to so much investigation and experiment of late years. By this arrangement, the engine attached to the road-carriage is so simple in construction, and so completely under control, that it is possible to stop the carriage, when traveling at the rate of 6 miles an hour, within a distance of fifteen feet. An annulus, provided for the emission of steam in a continuous flow, prevents the noise of puffing and snorting of the engine, and obviates all difficulty and danger of horses shying or becoming frightened. It is stated that the inventor of this road-steamer has applied the principle here involved in the manufacture of a private traveling-carriage, and proposes to build steam-omnibuses for city convenience and traffic. The small private carriage, after many experiments in the most crowded streets of Glasgow, was found to be perfectly manageable, while the steam-omnibus, according to the plan proposed, will, it is believed, prove equally favorable in its operation, besides being from 40 to 50 per cent less expensive in working than an ordinary horse-omnibus of the same capacity.

Poor's Railroad Manual—1874-5.

THIS volume, the seventh of the series, resembles its predecessors in its general appearance and in the character and arrangement of its contents. The organization, construction, operations, and financial condition of the various roads in the United States and Canada are given from the most reliable data. The accuracy of the information embodied in these details improves from year to year, owing to a greater willingness on the part of railroad companies to furnish such information, and the more complete returns that are made in obedience to State laws. A large number of the reports, however, are meagre and defective, being framed according to no comprehensive or uniform model, and containing only such statements as the parties interested deem it expedient to make. This renders the task of the compiler, in constructing tables for the purpose of showing general results, a very difficult and arduous one, and at the best, such results can only approximate correctness. The tabular statements contained in the introduction to the volume are as full as the materials for making them will permit, and much more complete than they were a few years ago. They afford an analysis of the condition of our railroads in the aggregate that is valuable for reference and comparison; and until the voluntary system of making reports is entirely abolished, and a compulsory system adopted according to a prescribed and uniform formula which shall cover every detail of operation and business, we are not likely to have any general railroad statistics that will be free from guesses and estimates.

According to the tables referred to, there were 70,651 miles of railroad constructed in this country at the close of 1873, being an increase of 3916 miles against 6167 for 1872. The total length of line of which reports of earnings, etc., are given, is 66,237 miles. The expenditure for construction in 1873 was fifty per cent less than during the previous year, a contraction of payments that has had a most depressing effect upon all industries connected with railway-building. We give herewith some of the leading items from the statements contained in the introduction:

	1873.	1872.	Increase.
Miles of road	66,237	57,323	8,914
Aggregate cost	$3,784,543,034	$3,159,423,057	$625,119,977
Capital stock	1,947,638,584	1,647,814,113	299,794,471
Debt, chiefly funded	1,836,904,450	1,511,578,944	325,325,506
Average cost per mile	57,134	55,116	2,018
Gross earnings	526,419,635	468,241,055	58,178,580
Freight earnings	389,035,508	335,931,785	53,103,723
Passenger earnings	137,384,427	132,209,370	5,175,057
Working expenses	342,609,373	307,486,682	35,122,691
Net earnings	183,810,262	160,754,373	23,055,889

The following are averages per mile:

	1873.	1872.
Capital invested	$57,134	$55,116
Stock	29,402	28,743
Debt	27,732	26,373
Gross receipts	7,948	8,256
Working expenses	5,174	5,366
Net earnings	2,775	2,890
Average dividend per mile	1,013	1,124
Proportion of working expenses	65.1 p.c.	65.0 p.c.
Proportion of net earnings to capital	4.85 "	5.20 "
Average rate of dividend	3.45 "	3,91 "

The current volume also contains a list of horse or street railroads in Massachusetts, New-York, and Pennsylvania, with details of their operations; also statistics of the New-York State Canals; a statement of Congressional land grants to railroads from 1850 to 1871; and a statement of National and State debts and liabilities.

Railway Inventions.

A NOVELTY in the way of recent railway inventions is an improved pneumatic station-indicator, which possesses at least the merit of simplicity. There is a case containing a roller and a chain of name-plates. This roller is turned the width of one face at each station, to present the plates having names of the stations in front of the sight opening; and the arrangement is such that the name-plate can not be carried beyond the point of showing the name of the last station on the route in case the car should be run beyond its route on another section or division, and it is held ready for running back on its own route. Springs are employed to allow the roller to turn, in case the mechanism for turning it is kept in operation after passing beyond the terminal station, and to pull the roller back each time. The special value of this plan is exhibited in case the car should get coupled in a train for a road or station to which it does not belong, with cars having annunciators for that road, so that its annunciators would of necessity be coupled with the others, and thus have to be worked that the others may be, as is well understood in the management of railroads.

Another invention of note, in this line, is a car-coupling device, intended to meet some of the difficulties existing in the arrangements at present employed. In this case, the forward ends or faces of the bumper-heads are rounded off, being made oblong or elliptical

in their general form, and in the face of the bumper-heads is formed a high and narrow opening, with straight ends and curved or concaved sides. The coupling-hook has in one end an eye to receive a bolt, which passes through vertical slots in the sides of the bumper-heads, to pivot the hook to said heads, the parts of these bolts that pass through the slots of the bumper-heads being flattened, so they can not turn to work the nuts screwed upon them loose. The bolts may be raised or lowered to adjust the position of the hook to the height of the adjacent car, and in the forward lower part of the mouths of the bumper-heads, there are inclined plates, for the beveled forward end of the hook to strike against, and slide up, as the cars are run together.—*Railway Register.*

Burl Walnut.

BURL or French walnut, says the *Trade Bureau,* is noted and prized for its variety of fine figures and its hard, fine grain, or, perhaps, more properly speaking, its absence of grain. In these qualities it is superior to rosewood or mahogany, and the wood itself is susceptible of a high degree of polish, requiring a comparatively short space of time only for manipulation. This wood, too, is remarkable for its beauty, and it would be difficult to find two veneers alike in figure or color, unless cut from the same block, and even then there would be perceptible marks of difference. This very beauty should tend to make the wood choice, but the demand for it is so great that it is used unsparingly on every article of furniture, from the cheapest bedstead to the costliest cabinet. It would be useless to urge economy in its application when a piece valued at twenty-five cents, placed on an eight or ten dollar bedstead, will yield an extra two dollars, but it does seem a pity that this fine wood should be wasted on cheap work.

Four or five years ago, burl walnut was a rarity, used only on fine work, and then in moderate quantities only; hence it was duly appreciated. Now, fine work is covered with it, and cheap work has patches of it here and there without regard to design or meaning. If it must be used indiscriminately, let it by all means be put on tasty panels that have a significance. The manner in which panels are finished on some cheap work is truly horrible. The grains are imperfectly filled without any rubbing down, and then covered with a coat of cheap shellac. Frames for parlor work, bookcases, desks, tables, and other articles of furniture in endless variety, are crowded with this wood to such an extent that it is to be feared people will tire of seeing it, and thus will be lost to the trade the use of one of the prettiest woods on the cabinet-maker's list.

Getting Rid of Switches and Turn-Outs.

AN English inventor proposes to do away altogether with switches, turn-outs, and crossings of other railways, by making the up and down lines continuous from end to end, and providing apparatus at stations for lifting the train bodily from one track to another or to the lines of a railway running in another direction. Thus it is claimed any "accidental" misplacing of a train will be prevented. The train would only have to be lifted an inch or two from the track, and the hydraulic apparatus now in use would easily do the work. It is said that the operation would save much of the time now consumed in switching, and that, except for the first cost of lifting apparatus, it would not be any more expensive than the present method of switching trains from one track to another by means of switches too often misplaced. But the end desired by the English inventor has been obtained on some American railways for the last five or six years, without the use of any such cumbrous machinery. Several years ago, the Wharton patent safety railroad-switch was put on the main line of the Reading Railroad, and after practical trial for eighteen months was pronounced thoroughly satisfactory, and the right to use it on the entire line was purchased. By the use of this switch, the continuity of the track is never disturbed, and the cars on the main track are perfectly protected, whether the switch is fastened right or wrong, or whether it is not fastened at all, but left loose. The controlling principle of this switch is the use of a guard-rail drawing the car-wheels to a switch-rail having an upward incline sufficient to carry the flange of the wheel over the main rail, and thus to put the car on the switch without breaking the main line.

Improved Journal-Bearing.

THE cuts illustrate an improvement designed to equalize the wear of journal-bearings, by providing for a uniform pressure upon the journal. Fig 1 is a side-view of a journal-box, showing the application of the improvement; Fig. 2 is a cross-section of the same; and Fig. 3 is a perspective view showing the form of bearing and key. The invention consists in the use of a rigid hard-metal key *b*, having a central groove or bearing-point in which rests a corresponding projection of the journal-box *a*, this key fitting closely upon the face of the brass or other soft-metal bearing *c*. The ends of the key are beveled, as shown, so that the whole bearing of the box comes in the center, while the weight is distributed, by means of the key, equally

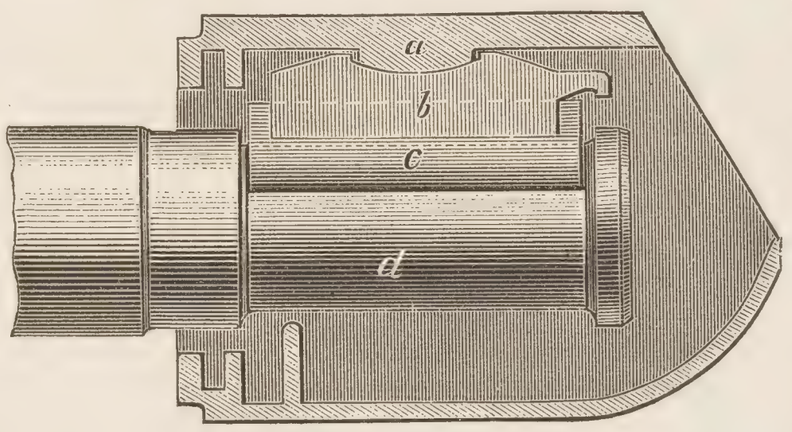

Fig. 1.

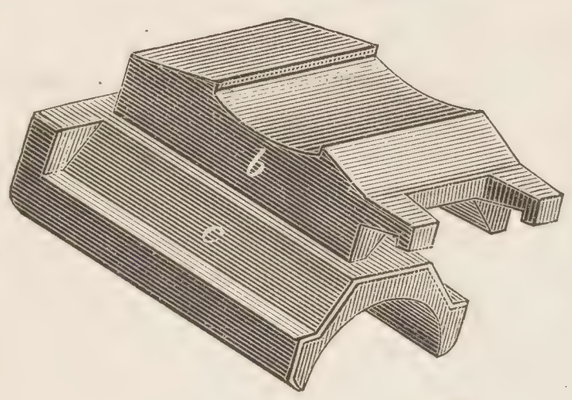

Fig. 2.

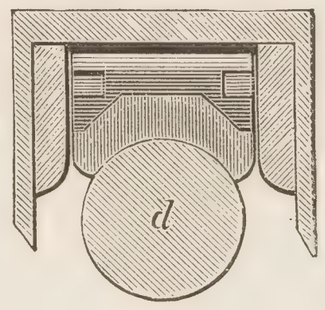

Fig. 3.

upon the entire length of the soft-metal bearing, and prevents the ends from springing up when the bearing gets worn thin. This construction also permits any vibration caused by inequalities of the track, and reduces to a minimum the wear of the journal. It will be noticed in Fig. 2, that the edges of the bearing are rounded for the purpose of returning or feeding back the oil which may be caught on them from the rotating journal, *d*.

It is claimed that this arrangement is superior both to a central bearing of the journal-box on the brass alone, or of its entire upper surface upon the plane face of a key, the former causing unequal wear and waste of metal, and the latter admitting of no vibration. The improvement is the invention of a practical car-builder, who has patented the same. Further information in regard to it may be obtained by addressing James McGee, Houston and Texas Central Railroad, Houston, Texas.

COLONEL J. H. STEVENS, who has been engaged to set trees along the line of the Northern Pacific road for a wind-break, has been superintending the planting of a nursery of 100 acres of poplars, cottonwoods, willows, and similar trees on Goose Creek, about thirty miles beyond Turyo, Minn. The trees will be transplanted from this nursery.

Wear upon the Track.

THE wear upon the track is produced by three elements: first, the locomotive; second, the cars; and third, their contents. It is, moreover, affected by the speed, and the gradients and curves. It can not, therefore, be expected to be in any constant relation with the contents of the cars or the tonnage of the road, except so far as this dictates the character of the trains which must be run, the proportion of empty cars which must be hauled to provide for the business, and the full or partial loads for the cars, or for the locomotives as a through or local traffic predominates. It is believed by the writer that a very large part of the wear and destruction of iron rails is due to the action of the locomotives. The exigencies of the service having led to the modern practice of placing upon driving-wheels weights which approximate closely to the crushing point of iron, the locomotive alone, probably, does more mischief to the rails than the rest of the train. If this be true, it would follow that roads with a heavy traffic can not afford to lay any rails but steel in their tracks, while it is probable that many lines now laid with iron, whose business is yet to be built up, can not afford to run the heavy locomotives which most of them are provided with, and that they would save large future renewals by exchanging them for lighter engines. It will be noticed that track repairs alone amount to about 20 per cent of the cost of transporting freight, so that the importance of selecting the very best material for the track becomes at once apparent. It is chiefly from this, in connection with improved methods of car and train service, that future cheapening of transportation is to be expected.—*O. Chanute's Paper on Freight Traffic.*

A Good Education.

THE late Edward Everett condensed into a single brief paragraph his estimation of what constituted a good education. Here it is: "To read the English language well, to write with dispatch a neat, legible hand, and be master of the first four rules of arithmetic, so as to dispose of at once, with accuracy, every question of figures which comes up in practice—I call this a good education. And if you add the ability to write pure, grammatical English, I regard it as an excellent education. These are the tools. You can do much with them, but you are hopeless without them. They are the foundation; and unless you begin with these, not with flashy attainments, a little geology, and all other ologies and osophies, are ostentatious rubbish."

IN England, it has been found that three hundred pounds falling fifteen feet broke an eighty-pound rail. German engineers have long applied a test of one thousand pounds falling ten and one half feet. In this country, fifteen hundred pounds falling six feet is considered an extreme test. In Austria, a test for steel rails has been established, of two thousand pounds falling thirteen and one half feet, representing, it is said, about one and a half per cent carbon. German engineers say three tenths of one per cent is the minimum limit of carbon a steel rail should possess, otherwise the rail is too soft. In England, a test was adopted of two thousand two hundred and forty pounds falling fifteen to seventeen feet on a rail resting on heavy bearings.

MR. WILLIAM WILCOX, Superintendent of the Shore Line Division of the New-York, New-Haven, and Hartford Railroad, was killed by an accident to a train on his division at Stony Creek, Conn., July 7th. The train was thrown from the track, and as Mr. Wilcox, who was standing in the door of the baggage-car, jumped to the ground, the car upset and fell on him, killing him instantly. He had been a conductor on the road for many years, and was appointed Division Superintendent in the fall of 1872, succeeding Mr. S. H. Scranton.

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No.* 32 *Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column,* $5 *per month, or* $50 *a year. For half a square,* $3 *per month, or* $25 *a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

To Our Subscribers and Readers.

THE subscription price of the CAR BUILDER is only $1.00 a year. Should every one of our readers remit us this sum promptly in advance, the total amount realized from this source would cover but a small part of the expense of publication. We need it, however, on this account all the more, and trust that those of our subscribers who are in arrears for the current year will at once respond to this notice by sending us by mail a dollar at our risk, and for which a receipt will be promptly returned. This will save us the trouble of forwarding bills for so small a sum, as well as a considerable item of postage. We are sure that our price of subscription can be regarded as little more than nominal, considering the size of our journal, its typography, illustrations, and the quantity of reading matter contained in each number.

THE official report of the proceedings of the Car-Builders' Association, at their Cincinnati meeting, will be ready for distribution some time during the present month, and will contain the reports of committees in full, the committees for the current year, list of members, constitution, and other appropriate matter. The volume will be uniform in size and binding with that of last year.

THE monthly meetings of car-builders, at the rooms of the Association in this city, have been suspended during July and August. The next one will be held on Thursday, September 17th.

THE Executive Committee of the American Railway Association recommend the publication of a quarterly journal, under the auspices of the Association, to be devoted to railroad matters.

Rolling-Stock Estimates.

WE give below the results of an examination of the returns of railway rolling-stock, as given in *Poor's Manual* for 1874–5, with the view of ascertaining, as near as the data will enable us to do, the number of engines and classification of cars in the United States and Canada. The aggregate, as compared with previous estimates made up from other data, is, we are inclined to think, approximately correct; but as respects the classification of freight-cars, the result is less satisfactory, not through any fault of the compiler, but from the failure of a large number of roads to classify their returns. The passenger-train cars are, almost without exception, given in such detail as to render a general classification comparatively easy; and a majority of the roads also return their freight equipment in such form as to be readily analyzed with a view of reaching general results. Others, however, including a number of leading and important lines, merely state the gross amount of their freight rolling-stock, with no attempt at classification. The following is the general summing up as derived from the Manual, embracing engines and revenue-cars on the roads of the United States and Canada:

Passenger-cars of all classes	9,902
Baggage, mail, and express cars	4,157
Box, merchandise, or house cars	87,009
Platform, gondola, and flat cars	52,198
Stock-cars	14,222
Coal-cars (number of wheels not stated)	66,887
Four-wheel cars (mostly coal)	37,892
Caboose-cars	1,549
Oil-cars	3,154
Ore-cars	2,102
Lumber cars	193
Freight-cars not classified	94,694
Total	373,959
Locomotive-engines	14,939

Deducting from these aggregates 774 engines and 13,980 cars of all classes, as returned by the Canada roads, leaves for the roads in the United States a total of 14,165 engines and 359,979 cars, exclusive of what are denominated service-cars, and inclusive of narrow-gauge cars. This is as near an approach to accuracy as the returns we have to deal with will permit.

The unclassified freight-cars returned in gross, as above, belong to such roads as the New-York Central and Hudson River; Erie; Great Western of Canada; Pittsburg, Fort Wayne and Chicago; Central Pacific; Central of Vermont; Atlantic and Great Western; Albany and Susquehanna; Cleveland and Pittsburg, and others of less importance. Any attempted classification of these would not be much better than guess-work; but in order to present a general statement or estimate, we will distribute the 94,694 cars not classified in the returns—or rather divide them up in about the proportions indicated by the classified returns. The following will then be the result:

Passenger-cars of all classes	9,902
Baggage, mail, and express cars	4,157
Box, merchandise, and house cars	124,009
Platform, gondola, and flat cars	76,198
Stock-cars	16,722
Coal-cars (number of wheels not stated)	86,887
Four-wheel cars (mostly coal)	47,284
Caboose-cars	2,000
Oil-cars	4,000
Ore-cars	2,600
Lumber-cars	200
	373,959
Less, returned by Canada roads	13,980
Total on United States roads	359,979

The returns which are the basis of these estimates are made, we suppose, at the close of the fiscal years of the various roads, which will embrace a period covering the last four months of 1873, a large proportion being up to December 31st. The total number of cars on the United States roads is nearly 10,000 in excess of an estimate made in the February CAR-BUILDER, and which was a sort of average or compromise as compared with several others, including one submitted by Mr. Garey to the Car-Builders' Convention, at Boston, in which the whole number was put down at 340,787. A later estimate of the *Railway Monitor* was 352,152, exclusive of Canada.

The figures above given indicate that the additions to the car and locomotive equipment of our roads have been very light during the past year, as compared with that of previous years, nor is it likely that much will be required for new roads during the current year. It is evident, however, that the existing and prospective traffic of the roads already in operation will necessitate very considerable additions before long to replace cars that are constantly wearing out, the general wear and tear having been proportionately greater since the panic, as every thing available in the shape of rolling-stock has been pressed into service to avoid expenditure for new.

The difficulty of arriving at any thing like accuracy in general details as respects this special feature of railway operation, is altogether due to the loose and imperfect reports of numerous roads. These reports, to be of any value in making up statistics, should not only be specific as to details, but should also be uniform in method, and made with a view to compilation, analysis, and classification. It is an almost useless labor for one road to make an elaborate return of every thing, from a locomotive to a hand-car, while another comprises it all in one or two lumps, leaving the compiler to guess what the lumps are composed of. No very satisfactory use can be made of such material for the purpose of reaching general conclusions in regard to the condition and progress of a vast and complicated railway system. We hope the next issue of the *Manual* will exhibit an improvement in this respect.

Patented Car Improvements.

THERE were one or two points in the proceedings of the Car-Builders' Association, at its late meeting, in which a peculiar sensitiveness was developed about discussing the merits of patented devices. The impression seemed to prevail with many of the members that such devices were not only inadmissible as legitimate topics for discussion, but that committees, in making their reports, must not indorse or recommend any such devices for adoption, no matter what might be their actual merits. This, in our judgment, is a mistake which can not be too soon corrected; nor do we think that, in order to do so, any alteration of the constitution of the Association is necessary. That instrument, as it is now, merely forbids the admission of patentees or their agents to advocate their claims at any of the meetings of the society, but does not prevent the members from freely expressing their views in the regular course of discussion upon any invention or device, whether patented or not. To suppress all discussion with respect to patents would seriously hamper the Association in the exercise of its proper functions, and so far destroy its usefulness. It must necessarily be progressive or disband. Its very existence is an admission that car-construction is not all that it should be, and that it is important to determine what particular improvements are most worthy of being adopted. A multitude of these are constantly pressed upon the attention of railroad men, some of which are good, some bad, some indifferent, and all, or nearly all, patented. A choice must be made; and in order to choose the best, there must be investigation and discussion. What harm can result from talking about couplers, brakes, ventilators, heating apparatus, springs, roofing, and what not, with a view to increased economy, safety, and general utility? and who are more competent to decide upon the relative merits of these various appliances than car-builders themselves? Provision has already been made for the exhibition, at each annual meeting of the Association, of such models as inventors may furnish, and an opportunity thus be afforded to members for their examination.

But there is a trouble attending this matter which can not altogether be got rid of, and which accounts for the sensitiveness to which we have alluded when

questions arise involving the merits of particular inventions. Human nature is fallible, and men in their business relations are liable to be swayed more or less by motives of self-interest. If this, that, or the other patented device is officially indorsed, a suspicion is apt to be aroused that undue influences have been enlisted in its favor, that somebody's axe is being ground and somebody's fortune made, while others equally worthy fail to get what is justly their due. Indeed, it is hardly to be expected that entirely disinterested action on the part of every individual member is possible in deciding upon the claims of rival patentees ; but it must nevertheless be evident that such action, whether disinterested or otherwise, can not be altogether evaded without placing the Association in an attitude to provoke, as it has already done from an influential quarter, severe and disparaging comment. It is not the business of the Association to make or unmake the fortunes of inventors or patentees, or to discriminate between rival claims, except on the score of actual merit, and as the interests of railroads may be affected thereby. If the Miller platform or the Westinghouse brake is a good device now, let both be indorsed and approved ; but as soon as either is surpassed by something better, let it be condemned. There is no evading this obvious duty. The Association has got to recognize patented inventions and pronounce upon their respective merits, so far at least as they apply to railway-cars, or be exposed to comment and criticism, such as may be found in the *Scientific American* of July 18th.

The Wisconsin Decision.

THE decision of the United States Circuit Court, in Wisconsin, refusing an injunction to restrain the State authorities from executing the so-called Potter railroad law, is by no means final, but merely a preliminary step toward an adjudication of one of the most perplexing and complicated questions that has arisen during our national progress. So far as the present decision has any effect, it leaves the question of the validity of the Wisconsin law judicially undetermined. It refuses to interfere in the application of the law to local traffic, or traffic wholly within the State ; and with respect to that between Wisconsin and other States, no opinion is given. The whole question remains open, and will be carried as speedily as possible to the tribunal of last resort.

The controversy is one of great magnitude in its bearing upon the business interests of the country, and until it is settled so that the rights of railway corporations and their relations with the State and Federal governments shall be clearly defined and understood, there will be a check to railway progress and a withholding of capital from investment in new enterprises. It seems to us that the necessities of the case will eventually give birth to a new or special code, differing in many respects from any which have hitherto been applied to corporations—a code that will be an adequate protection to railway ownership and also to all rival interests. If in the eagerness to develop vast areas of unsettled territory, railroads have been constructed on a wrong basis, in disregard of fundamental laws and of the inevitable complications which were sure to arise in the future, the case will not be improved by a ferocious, uncompromising, hand-to-hand fight, as if it were possible for one interest to tomahawk and scalp the other out of existence, and restore general prosperity in that way. Neither can it be done by a rigid, technical adherence to the letter of existing statutes and constitutional provisions, because such provisions and statutes have not been framed with any special reference to the emergency which has arisen.

The people of this country are not going to deprive themselves, or to be deprived, of the benefit of railroads ; but they desire that such benefit shall be the utmost that can be derived from an honest, judicious and economical management of such roads. How to secure this is the problem to be worked out. Private capital invested in railroads or in other enterprises seeks only private gain and emolument, and will not tolerate any thing like a practical separation between ownership and control. It is obvious, however, that with respect to railroads, there must be some efficient regulating power. Reason and experience have shown that mere competition is not to be relied upon, as it necessarily begets combinations and fluctuating tariffs that are seriously detrimental to general business. Exclusive State control by means of fixed, variable, or discriminating rates adjusted by impulsive and ill-informed legislators, would seem to be equally impracticable, as it lacks the indispensable basis of a thorough knowledge of the capacities of each road. Nothing, it seems to us, will meet the case but some kind of a mixed commission, in which the State and corporations shall be fairly represented, and whatever regulations or discriminations shall be made shall receive the approval of men who are thoroughly familiar with the cost, traffic, running expenses, liabilities, and management of each and every road subject to their jurisdiction, as well as with all the anomalies and paradoxes of the science of transportation which now so deplorably mislead and obfuscate the average legislative intellect. Not only this, but there must be a softening of present acrimony, a more rational comprehension of the real difficulties of the problem, and an end of hasty legislation dictated by confiding ignorance. The final adjustment may be a good way off, but when it is reached, it will be on such a basis as will protect the interests of stockholders from invasion and virtual confiscation, and the community at large from the evils of corporate encroachment and mismanagement.

Our Directory.

IT is our desire that the names and address of the various railroad officers embraced in our directory shall be as correct and reliable as possible. We are aware, however, that many errors exist which we are unable to correct unless the necessary information is furnished us by individual roads or by parties connected with them. We often receive letters expressing surprise that the name of Mr. So-and-so should be retained in our lists, when he ceased to have any connection with the road to which his name is attached, six months or a year ago ; or advising us that his post-office address is wrongly given, or his name wrongly spelled. In making our monthly corrections, we avail ourselves of various sources of information, official circulars, private correspondence, current newspaper announcements, manuals, guide-books, etc., all of which are very good as far as they go ; but considering the frequent changes which are taking place, our principal reliance for early and infallibly correct information is upon the parties themselves who fill the respective positions named in our directory. We would therefore earnestly request such parties, as well as others who may notice errors of omission or otherwise, to give us prompt notice of the same. Five minutes' time and a postal-card are in most cases all the outlay that is necessary on their part, while the information conveyed will be of great value to all our readers. We would also request that, in sending us the names of persons or their proper places of address, such names should be correctly and plainly written, and that the initials J, I, F and T be printed out, or written so as to be readily distinguishable.

The Business Outlook.

IN a time of drouth, it is safe to predict rain, because we know that in the economy of nature there is an inevitable law of reaction ; and in a period of business depression, we know that it can not always last, because the elements exist which are certain to bring about renewed activity. These elements are manifest and visible all around us. The great staple products of grain and cotton, to say nothing of other crops which promise an abundant yield, will in a few weeks add untold millions to the wealth of the nation. There is midsummer stagnation now, and dullness prevails in all departments of trade and manufacture ; but is it rational to suppose that the crops now maturing are to be gathered in to rot in warehouses, that exchanges and consumption will cease, the reduced stocks of general merchandise remain unreplenished, and the accumulation of unemployed capital wait in vain for profitable investment? and all because a few railroads have been built on speculation, and have come to grief for the lack of capital and earnings to meet their obligations. We admit there is a present want of confidence in railroad securities which ties up capital and keeps it in abeyance ; but it is a significant sign that, notwithstanding the Wisconsin imbroglio and the record of embarrassment and bankruptcy of the past eight months, choice securities are more in demand and command better prices than before the panic. The movement of the crops which must soon begin will give employment to capital and also to the roads ; confidence will gradually be restored, the machinery of trade set in motion, and the activity thus inaugurated will be legitimate and lasting. The crippled roads will gradually get upon a better basis, and with the natural development and increase of traffic, there is no reason to doubt that existing lines will be improved, and new ones constructed wherever they are really required. If this is a rose-colored view of the situation not justified by present appearances and indications, then the history of previous revulsions in trade and business is no criterion by which to judge, and any speculation in regard to the future is of no avail.

The American Railroad Manual.

THE second volume of this admirable work has just been issued. It very much resembles the first volume in its general appearance, and contains about 80 additional pages. The editor, Mr. Edward Vernon, is a recognized authority in railway history and statistics, and the work is exceedingly valuable as a record of the origin, management, and growth of the various roads, and particularly of the older ones, the history of which, embracing all the changes, vicissitudes, and transformations incident to their progress, is here given in full and connected detail. A similar record exists nowhere else. The present condition of the several companies, financially and otherwise, with tabulated statistics, is also given ; also a series of well-executed maps of States and groups of States, embracing all the railroads in the country, with their lines distinctly traced and names legibly printed. There is also a general map contained in a pocket in the cover, which can be taken out and examined separately. The typography, paper, and binding are excellent, and as a specimen of superior book-making, the volume is very attractive, and rivals in many respects some of the ponderous gift-books of the day.

The introduction contains an elaborate editorial review of the causes and results of the late panic, a list of roads in default for non-payment of interest, a review of railroad construction for 1873, and other interesting matter. Many improvements have been made in the work since the publication of the first volume, which render it of great value to the general public as well as to railroad officials. The editor says in his introductory editorial remarks :

"And still the *American Railroad Manual* is far from being complete ; in fact, a work of this kind *never* can be made perfect so long as the compilation of facts and figures pertinent to the extended railroad system of this country is dependent on private enterprise, and on the voluntary sympathy and co-operation of railroad officials, and so long as there is a want of uniformity in keeping railroad accounts and different fiscal years."

IT is said that the largest locomotive in the world is the "Pennsylvania," on the Philadelphia and Reading Railroad. The principal dimensions of this engine are as follows : Diameter of cylinders, 20 inches ; length of stroke, 26 inches ; number of driving wheels, 12 ; diameter of drivers, 4 feet ; and the weight of the engine alone is 60 tons.

Judge Maine on Car Ventilation.

To the Editor of the National Car-Builder:

DEAR SIR: I have read with interest and surprise the report of the committee on the heating, lighting, and ventilation of cars, made to the Car-Builders' Convention at Cincinnati, and published in your July number. I find no fault with the committee for any lack of knowledge exhibited by them on the subject of ventilation, but when they undertake to report and pass judgment upon an invention, as they have done upon mine, without any examination or effort on their part to correctly understand its working, I claim the privilege of disabusing the minds of your numerous readers with respect to any wrong impressions they may have received. The committee, in referring to my plan for ventilating cars, use the following language:

"Judge Maine proposes admitting the air at the bottom of each window, and leaving the control of quantity admitted to the occupants of each seat. This may be a slight improvement on the plan of raising each window slightly, although to us the principle seems about the same. We should question the practicability of keeping out the fine dirt in this way, in dusty weather, and still more the practicability of heating the cold air along the floor, where the heat is most needed."

Here the important difference is entirely ignored between admitting air into a car in horizontal lines or currents, and admitting it by *deflection*—a difference which any school-boy of average intelligence could hardly fail to comprehend. In the one case, the inflowing current strikes directly against the passengers, while in the other it is deflected upward, and does not strike them at all. As my invention has been thus rudely brought to public notice without such test and examination as the members of the committee were invited to make, but for some reason did not make, I will now describe and explain it, and also challenge for it the severest criticism by this committee, or by any one familiar with the science of ventilation.

I prefer to place my ventilator *under the window*, but it may be placed elsewhere in the car if preferred. It is in the nature of a compound box, the outer section of it receiving the air, and by a self-acting valve while the car is in motion, forcing it into the inner box, where it passes through gauze wire-cloth while being deflected; and here let me say that no one need "question the practicability of keeping out the fine dirt in this way," for the size of the particles of dust admitted can be ascertained to a mathematical certainty. If the wire-cloth has 100 dents to the square inch, multiply the sides and it will give 10,000 meshes or openings about the size of the wires, each opening being about the 20,000th part of an inch. Now, are the particles of dirt capable of passing through such infinitesimally small spaces, as bad as the cinders and dirt coming in through an open window? The air thus freed from dirt is admitted through 32 ventilators at the same time, and in the immediate vicinity of the mouths and noses of the passengers, where it is most needed; and with the ventilators entirely open, and the car moving at the rate of 20 miles an hour, each ventilator will admit more than 200 cubic feet of air per minute, or 6000 feet for the whole car, and this without perceptible drafts or currents. This the committee could have seen for themselves had they accepted my invitation to witness the experiment; and also have witnessed the practicability of "heating the air along the floor where it is most needed."

The air thus admitted may move at any rate of speed, whether it be five or twenty feet per second, although the committee say that five feet should be the maximum when it comes in contact with persons. It should not, however, come in contact with persons at all when it enters the car, but should be *deflected*—a point of difference the committee failed to see, but it will not be overlooked by the reader. We will continue the supposition that a car equipped with my ventilator, and filled with passengers, is moving 20 miles an hour, the outside temperature being 40°, and the inside 45° at the floor and 100° in the monitor—a clearly supposable case. We will open the ventilators and note the result: 32 columns of air will rise immediately to the top of the car, impinging upon the roof. These currents in their upward movement will attract and take up with them the contiguous air. On reaching the top, the cold, moist air will take on the lost heat of the car, and being still heavier than the dry, vitiated air, it will gradually settle to the floor in the center and fill the partial vacuum created by the air drawn up with the rising currents on each side; consequently all the air that comes in contact with the passengers first rises to the top, takes on the heat there accumulated, and, as it descends, still takes on the rising heat, so that by the time it reaches the floor or to the point where it will be attracted to the rising columns of air, it has acquired the common temperature of the car. Moist air, according to Prof. Tyndall, will take on seventy times more heat than dry air.

By this method of ventilation, the chemical freshness and purity of the air is preserved. All organic or morbific matter in the car, either from exhalation or emanation, is removed, so that it can not be inhaled a second time, *as it must be when the ventilation is downward,* as the rising air thus forced in through the ventilators will force it out through the otherwise useless exhaust at the top. This method utilizes the otherwise lost heat next the roof, makes the temperature uniform or nearly so in every part of the car, with less than 5° difference between the floor and top, while with the ventilators closed, the difference will be more than 40°. By admitting the air at thirty or more places at the same time, and deflecting it, drafts and currents are impossible; while, on the other hand, if a supply of air sufficient for sixty persons be received through one or two openings, drafts and currents are unavoidable.

Cars provided with the method of ventilation I have described are now running on the Eastern Railroad, and are daily subject to the inspection of thousands of passengers on their way to the seaside or the mountains, some of whom will in due time be heard from.

S. COLVER MAINE.

BOSTON, July, 1874.

VENEERS AND FANCY WOODS.—We doubt if there can be found in the country a more extensive and varied stock of these materials, so indispensable in car-building and general cabinet-work, than in the mills and warerooms of dealers in this city. Every part of the globe is explored in search of new varieties of choice woods, and the quantity imported is steadily increasing to meet the increasing demand for this species of embellishment in the construction of cars, boats, houses, offices, etc.

Among the oldest and most enterprising dealers in this line are George W. Read & Co., who have just received an extra choice lot of French and American walnut and ash burl veneers, also bird's-eye and curled maple. Their general stock of mahogany, walnut, rose, satin, Spanish and red cedar, and all kinds of hard woods, in logs, planks, and boards, is very full and complete, and will amply repay inspection by purchasers.

A. Parker & Co., 166 Center street, are also extensive importers and dealers, and have some very beautiful French veneers, selected by the foreign agents of the house, being remarkable for soundness and rare diversity of patterns. This concern also have an extensive assortment of other varieties, embracing whatever is desirable for the finest cabinet-work, houses, steamers, drawing-room and sleeping-cars, etc.

Cole & Comstock, 199 Center street, are also extensive manufacturers and dealers, and make a specialty of such as are adapted to car-building purposes. We refer to the advertisements of these several establishments on the fourth page of cover.

The Traveler's Official Guide, published by the National Railway Publication Company, of Philadelphia, is the most complete and comprehensive work of the kind ever issued, and an indispensable companion for travelers. The July number, like its predecessors, contains the time schedules, connections, and distances of all the roads in the country, and is a marvel of elaborate and intricate detail. The numerous changes that are constantly being made, sometimes several hundred in a single month, are carefully noted and the necessary connections made, so that every issue is reliable, or as nearly so as any such work possibly can be. Information in regard to ocean and inland routes of steam navigation, and a copious index of railway-stations are also furnished. The publishers also have in press a *Gazetteer of Railway-Stations* in the United States and Canada, which will be published before the next issue of the *Guide.* Price of *Guide,* $3 per annum; *Gazetteer,* in paper, $1; in cloth, $1.50 per copy.

THE *American Manufacturer,* of Pittsburg, the leading organ of the iron manufacturing interest, and one of the most valuable journals of its class in the country, appears in a new typographical outfit, and has also made a change in its mechanical make-up which renders its pages still more attractive for readers and advertisers. Two more pages have been added to its price-current, which makes its market report more comprehensive than that of any other trade paper in the country. It is edited with ability, and its weekly summary of manufacturing news is very complete and reliable.

The Artisan's Journal, published monthly, by R. Ball & Co., Worcester, Mass., F. Sherwin Briggs, Editor, is a special trade publication devoted to new inventions and improvements in mechanical appliances, and other matters of interest pertaining to the mechanic arts. It is quarto in form, beautifully printed on tinted paper, contains numerous illustrations, and an interesting variety of original and selected matter. Price, 50 cents a year.

THE *Artisan's Journal* says that it is a very common mistake for writers on scientific and mechanical topics for popular perusal, to indulge in technical terms and algebraic formulas to an unnecessary extent. Such writings often fall far short of comprehension by the readers to whom they are addressed. It does not need that the scientific writer should "stoop to conquer," or simplify his lucubrations to a childish degree; but good plain English, which persists in calling a spade a spade, should be used in all cases; leaving mere jargon of nomenclature to the society meeting, or the scientific quarterly. It is no disparagement to working mechanics that they do not generally understand these things; since it is sometimes a matter of doubt whether the writers do themselves.

THE *Railway Monitor,* issued July 15th, says: "There is more demand for general railway supplies, and the market is firm, with few changes. The purchases thus far are mostly for repairs, as there has been very little building begun; but most of the companies will resume operations early in the fall if the prospects for a good season continue as favorable as at present. In any event, it will be necessary for many of them to do considerable building, as their rolling-stock has been increased very little during the past year."

DEAN RICHMOND, of the New-York Central Railroad, wrote a most illegible hand, and an owner of a small building situated on the land belonging to the road having received a scrawl from him which he could not decipher, supposed it to be a free pass over the road, and when after waiting three months, Mr. Richmond asked the man why he didn't remove the building, he found he had been using the document to which his signature was attached as a pass, and had been riding on the strength of it all summer.

A NEW electric whistle for locomotives is now coming into use in France. It is intended to take the place of switch-signals ; opening the switch causes a copper plate a short distance off in the roadway to become electrified. A metallic brush on the engine transfers the current to the whistle, which is opened, and remains open until the steam is shut off by the engineer. If the engineer is neglecting his duty, the fact is at once made known by the continuous sound of the whistle.

THE Grand Trunk Railroad has given to the Rhode Island Locomotive Works, at Providence, the contract to build 50 first-class locomotives for its narrow-gauge track, the work to be done by September 20th. There were twelve bids for the job, and the contract price is $555,000.

A MIDNIGHT train of American Pullman palace-cars commenced recently to run between London and Leeds and Sheffield and Bradford. Similar cars will be run directly between London and Liverpool as soon as the Midland road is opened to the latter place.

MR. JOSEPH JONES, late superintendent of the car department of the New-York Central Railroad, at West-Albany, has been appointed manager of the carpentry department of the new State Capitol, at Albany, which is his present place of address.

THE Athol Railroad Company are about ready to begin work on their repair-shops in Springfield, Mass. They will be placed a short distance east of the freight-house, and will include a blacksmith's, machinist's, and carpenter's department.

MR. H. B. LATROBE, late Superintendent of the Chicago Division of the Pullman Palace Car Company, has been appointed General Superintendent of the Pullman Southern Car Company, with office at Louisville, Ky.

THE crop prospects all around, South, Southwest and West, are reported remarkably good, and if they at all fulfill their present promise, there will be flush times in the fall, the farmers not having been able to run in debt.

THE Vermont Iron Car Company, of St. Albans, has voted to sell out its entire property to the National Car Company for $1,000,000 in the stock of the latter company. The sale and consolidation will be at once consummated.

THE Chicago Car-Wheel Company, of which J. J. Simmons is the general manager, employ a capital of $50,000, and a force of 40 men, and are kept very busy supplying Western roads with their wheels.

THE Columbus Car Works, at Columbus, O., now employ 300 men, and are turning out 11 cars a day, on a large order for the Baltimore and Ohio.

MR. E. A. JEWETT has been appointed Superintendent of the Chicago Division of the Pullman Palace Car Company, in place of H. B. Latrobe.

A SHOP for building refrigerator-cars is to be established at Rochelle, Bergen County, N. J., on the line of the New-Jersey Midland road.

THE Cummings Car Works, at West-Bergen, N. J., are building a number of passenger-cars for the Rensselaer and Saratoga Railroad.

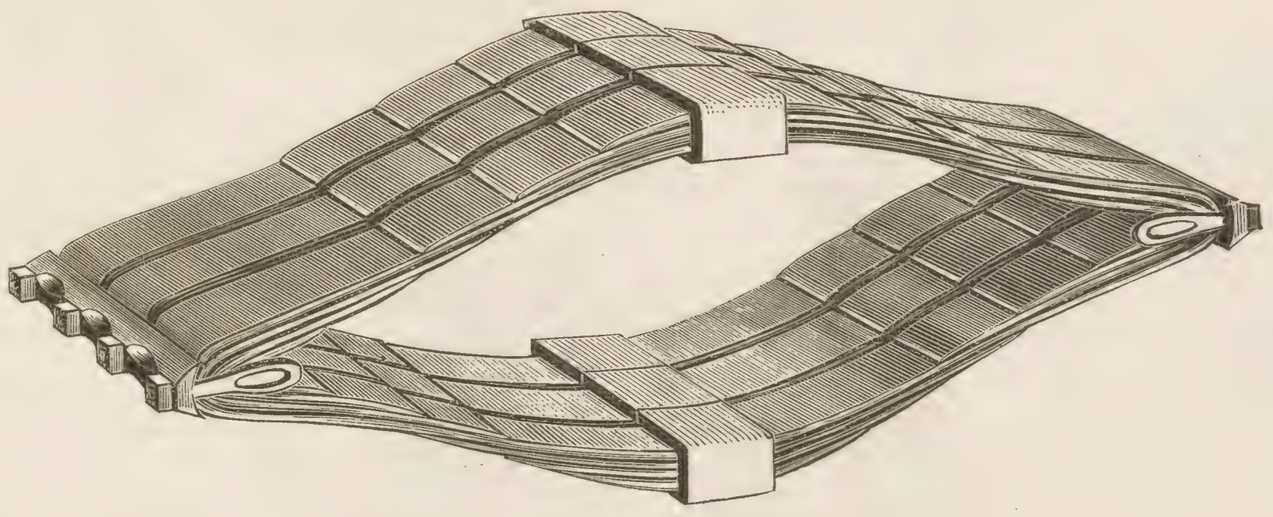
THE New-Haven (Ct.) Car Company have recently turned out some passenger-coaches for the New-Jersey Midland Railroad.

THE Harrisburg (Pa.) Car Company is building 40 cars for the New-York Central and Hudson River Railroad.

Cliff's Elliptic Passenger Coach and Freight Car-Spring.

THIS spring, of which the engraving is an illustration, has been recently invented by Mr. Edward Cliff, of this city, and is the result of prolonged experiment and investigation with the view of applying the elliptic principle in such form as to be better adapted to railway and other purposes than any springs of this class now in use. The leading peculiarities of its construction are shown in the cut, and consist of a continuous leaf or band supporting the upper and lower outside leaves, while it is itself sustained at the ends by the inside leaves, thus forming a bed-plate or surface upon which the short leaves act, the practical effect of which is an equal distribution of the pressure imposed upon the spring, so that it is sustained entirely by the short leaves, which are thus made to act against each other, while the central or continuous leaf is subjected to little or no strain at all.

The advantages of this arrangement are, an equal distribution of the steel, making the spring of a uniform strength in every part ; an equal distribution of



the pressure to be sustained ; a free and independent action of each leaf, making every pound of the metal available ; a saving of about thirty per cent in dead weight as compared with ordinary elliptics ; and also a corresponding saving in cost. The leaves are thinner and lighter, more elastic, and not so liable to break. The practical tests which have already been made of this spring clearly establish the superiority of this principle of construction as regards economy and utility. It can be modified to suit any required service, either for railway purposes or for ordinary vehicles. They are manufactured by Vose, Dinsmore & Co., who may be addressed for any further particulars in regard to them.

Pullman Cars in Europe.

MR. A. B. PULLMAN, Vice-President of the Pullman Palace Car Co., returned from Europe last week. He states that the result of his trip was quite satisfactory, and that he accomplished more in the short space of time he was there than he had expected. Pullman sleeping and dining-room cars are now running on the Midland Railway of England. Several other companies have opened negotiations, but will await the result of the Midland Company's enterprise. Mr. Pullman states that the English people are delighted with the American cars. They have been accustomed to being locked up in their little box coaches with no conveniences and plenty of discomforts, and the change is an agreeable one. Mr. P. is confident that the cars will be adopted on the other leading English lines.

He also opened negotiations with some German French, and Italian companies, and expects to go over and complete contracts with them some time in September. The company will doubtless have to build shops in Europe, as the American demand will occupy all the shops here, and it is not to be neglected. The shops will probably be located in Germany rather than in England, as German workmen are more progressive and adaptable than the English, who are obstinate, and cling to their old ways and notions.

Mr. Pullman also makes the statement, which will, doubtless surprise some of our wise legislators, that passenger rates on English roads are much higher than in this country. American roads pay their employees more, but do not make near as large profits. The Grangers should look after this. Unless those English railways are speedily regulated, their stockholders will make some profit on their investment, which should by no means be allowed.—*Railway Review.*

Facetiæ.

PRIDE takes an early start in San Francisco. When a lad breaks loose from his mother's apron-strings and secures a position at three dollars per week, the first thing he does after that is to hire a Chinaman to run errands for him.

A MARINE editor at Cincinnati dares to say that there is not a steamboat man on the Western rivers who would not die rather than tell the truth.

A MAN being somewhat puzzled to make out the meaning of seven D's inscribed on a tombstone in an old cemetery, asked a passer-by for an explanation. "That," said the latter, "is the tomb of Doctor Dudley, and the inscription means, Do, Dear, Devil, Decently, Damn, Doctor, Dudley."

A MAN in Wayne County, Miss., is feeding his cow on juniper-berries, in hopes to get her to give gin and milk.

A CINCINNATI reporter says that there is something grand in the sight of a pair of runaway horses ; but the Detroit *Free Press* believes that a good deal depends on whether a man is on a fence or trying to climb over the end-board of the wagon.

A PATERSON (N. J.) man who had placed several lightning-rods on his house, was delighted during a recent storm, at seeing it struck in two places, while the house of his neighbor, who was too mean to pay for a lightning-rod, was not struck at all.

ONE of the newly-rich of Boston having, after a long struggle, worked himself into good society by means of the aristocratic alliance of his daughter, gave a grand dinner-party to his newly acquired circle. He didn't invite his own brother, for the reason that "society is getting so mixed, one must draw a line somewhere."

AN old Troy River man says he is disgusted to hear people nowadays talk of low water in the Hudson. He remarks that he can remember well, years ago, when the river was low. He asseverates that at one time all the passengers on the New-York boat had to close their windows during the entire passage down, because the steamer's wheels raised such a dust !

A NEGRO parson, in Virginia, was preaching very earnestly about the certainty and the terrible nature and degree of the miseries of the damned, and when he had succeeded in working up himself and his awe-struck auditory to a high degree of excitement, he capped the climax after this fashion : "My friends, you all know Major Clark's furnace ; you have seen it often, how the white-hot coals just melt up iron thrown into it like as it 'twas snow. Well, if you took a sinner out of hell and threw him into Major Clark's furnace, he'd have an agur in two minutes."

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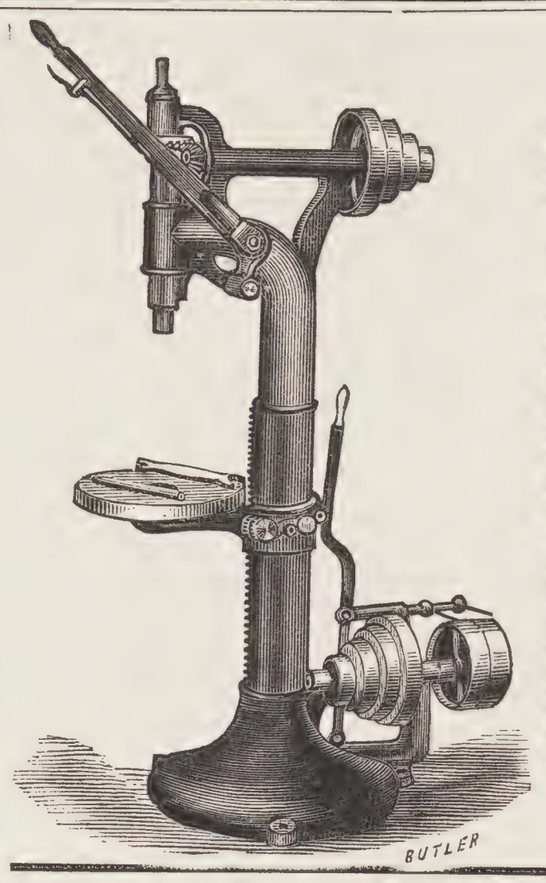

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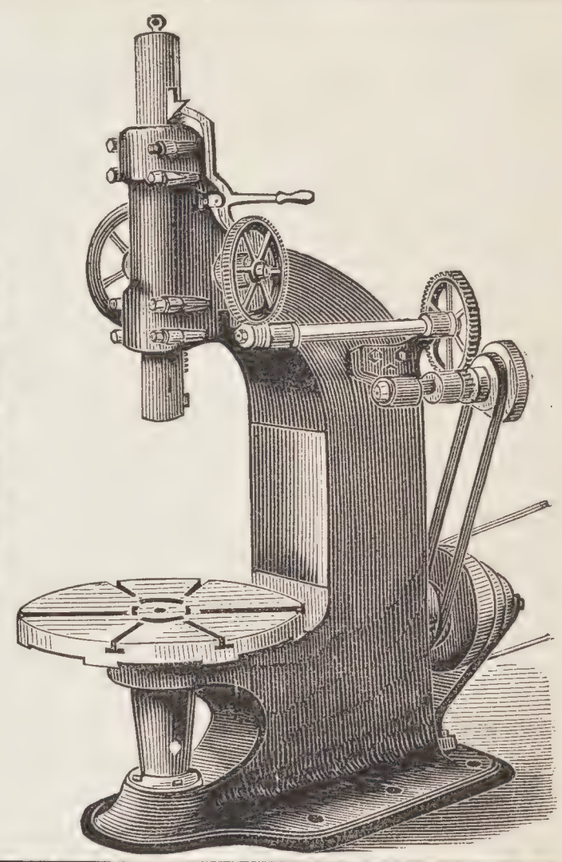

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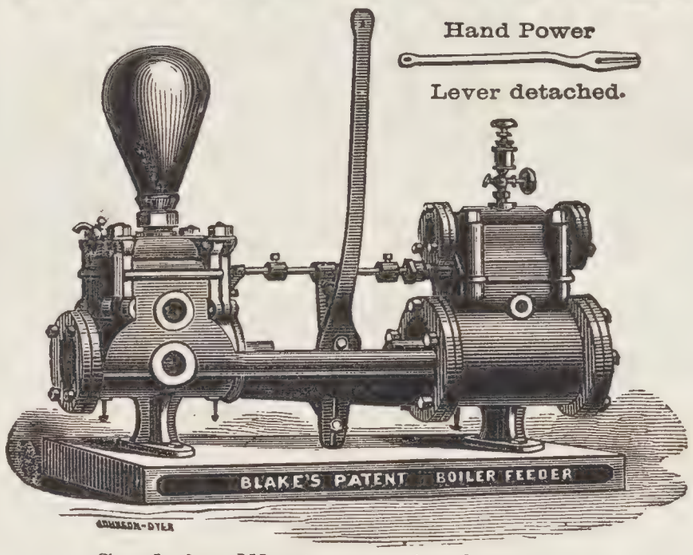

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PENNSYLVANIA RAILROAD—NEW-YORK DIVISION, JERSEY CITY, July 11, 1873.

GEO. W. BARKER, ESQ., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872, I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your resquest herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

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Arlington Car Manufacturing Co	Arlington, Vt.
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Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co	Bellefonte, Pa.
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Dickson Manufacturing Co	Scranton, Pa.
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Gardner, F. & Co.	Carlisle, Pa.
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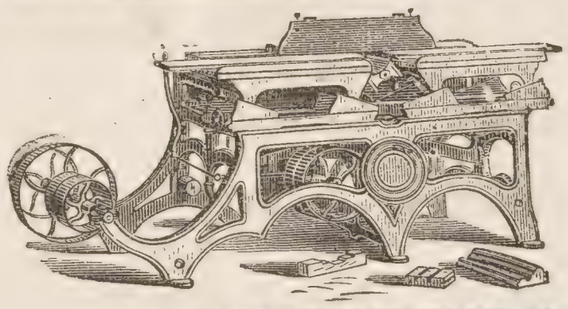

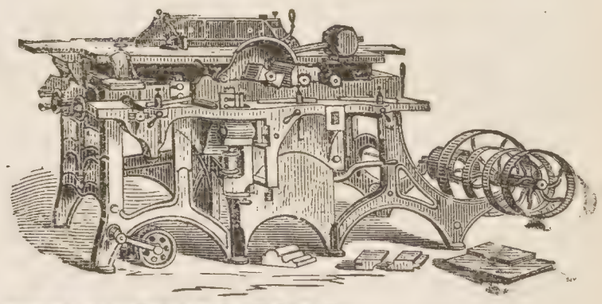

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Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M.W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford. Ct.
Connecticut Western	N. Slingland		Hartford. Ct.
Contoocook River			Concord, N. H.
Conn. & Passampsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	J. W. Sauerbach	Mt Savage, Md.
Central of Georgia	D. D. Arden	C. C. Millar.	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas.
Central R. R. of Iowa	F. B. Woodruff	T. L. Seevers	Marshall, Iowa
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento. Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland, Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley	A. B. Seaman,	Saeramento, Cal.
Truckee Division	James Velsir	C. Lindsay	Truckee, Cal.
Humboldt Division	H. L. Stevenson	Chas. Thompson	Carlin, Nev.
Salt Lake Division	J. G. McCuen	Thos. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa
Morris & Essex Division	W. H. Lewis	L S. Barber	Hoboken, N. J.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit. Mich.
Detroit, Lansing & Lake Michigan	Tho. G. Roberts		Ionia, Mich.
Delaware & Hudson CanalCo	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunk rk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville. Tenn.
East-Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
Erie Railway	§§Howard Fry		Susquehanna, Pa.
Erie Railway	‖Robert Wallace		Susquehanna. Pa.
Erie Railway	‖V. Blackburn		Jersey City. N. J.
Erie Railway	‖F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E. Cooper	W. E. Cooper	Hornellsville, N. Y.
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	J. W. W. McWood.	Montreal, Canada.
Grand Trunk			Sherbrooke, Can
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman.	T. M. Preval.	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland. Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H. L. Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith.	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams.		Amboy, Ill
Iowa Division	Thomas W. Place		Waterloo. Iowa.
Iron	Perry Scott.	Clem. Roetling	Ironton, Ohio
Indianapolis & St. Louis	A. J. Sanborn	R. B. More	Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells.		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Ka n
Keokuk & Des Moines Valley	Jas. Lamb	R. E. Smith	Keokuk, Iowa.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh.		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas	Chester, S. C.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div.	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Louisville, Paducah & So. Western	W. D. Robb	F. A. 'Felton,	Elizabethtown, Ky.
Lake Superior & Mississippi	**H. A. Towne		St. Paul, Minn.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River, Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Macon & Western	D. M. Gogul	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	M. Thornton	M Thornton	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Memphis & Little Rock	Tho. Rennells	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Mississippi Central	Henry Gibbon	John E. Becton	Water Valley. Miss
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere. Wis.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	B. S. Skates	I. T. Booth	Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville. Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford.		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y.
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland	‖Wm. H. Griggs	Wm. H Griggs	Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas. H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
New-Jersey Southern	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, Jackson & Gt Northern	N. Greener	N. Greener	New-Orleans. La.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon. Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S C.
Northern New-Hampshire	James W. Lander	Albert Langmaid	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Ohio & Mississippi		G. Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott		East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§Frank Thomson		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
Philadelphia and Erie	W. L Forster		Renovo, Pa.
Philadelphia and Erie	W. L. Holman		Kane, Pa.
Philadelphia and Erie	W. T. Smith.		Erie, Pa.
Philadelphia and Erie	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis			
Pittsburg & Columbus Division	E. Pierce	Thos. D. Furgusen	Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns		Connellsville, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	C. W. Furber	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.

Q

Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.

R

Raleigh & Gaston.			Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome. N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley.	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Selma, Marion & Memphis	R. H. Anderson.		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogul	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Seaboard & Roanoke	§A. Pendleton		Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Laughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Mannes	W. W. Peirce	Selma, Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N.Y.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.

T

Taunton Branch	W. M. Parks	J. G. Codding	Taunton, Mass.
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	W. H. Hipple		Marshall, Texas
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo. Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha. Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vicksburg & Brunswick	James Boon	J. A. Knight	Eufaula, Ala.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Crawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	C. Hamilton		St. Louis, Mo.
Cairo & Vincennes	N. L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	I. D Rucker		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee, Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	C. A. Swineford.		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡W. B. Strong		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	Robert Wason	Milwaukee. Wis.
Chicago, Pekin & Southwestern	N. V. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati Lafayette & Chicago	E. H. Waldron		Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware.	G. A. Jones		Akron, Ohio.
Colorado Central	T. E. Sickles		Golden, Col.
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H. E. Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing.	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead.		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent		Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer.	" "
Detroit, Hillsdale & Indiana	W. F. Parker.		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese.		Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer.	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western.	J. P. Farley		Dubuque, Iowa.

E

East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	*J. C. Clarke		New-York City.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,		Henry Bowman	New-York City.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler		East-Saginaw, Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce.	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana.	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana		William Mullins.	Pittsburg, Pa.
Grand Trunk		John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla.	M. H. Alberger.		Jacksonville, Fla.
Great Western (Canada)	William K. Muir.	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin		Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central.	A. Mitchell	O. Ott.	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind
Indianapolis & Vincennes		Wm. Mullins.	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse.	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf.		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis.		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Midland	W. W. Fagan.		Topeka, Kan.
Kansas Pacific	Edward S. Bowen		Kansas City. Mo.
Kansas Pacific	J. L. Woods		St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton.	Geo. P. Bowler	Covington. Ky.
Keokuk & Des Moines Valley	Geo. H Briggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound.		Kingston, Pa.
Lackawanna & Bloomsburg		G.W. B. Cushing.	New-York City.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. L. Holden	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahoney Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	S. B. Beaumont		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	J. C. Hadley		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Robert Meek		Clarksville, Tenn.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	John McLeod	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	William McRae	Solomon Hass	Macon, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	C. E. Van Cleve	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	A. S. Livermore		Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	H. E. Sargent		Chicago. Ill.
Michigan Central	§C. H. Hurd	John Newell	Detroit, Mich.
Grand River Valley Division	J. Desmond		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	W. Elwell		Sheboygan, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb	G. W. Cobb	Mineral Point, Wis.
Mississippi Central	R. N. Colquhoun		Water Valley, Miss.
Mississippi Central	*E. D Frost	S. H. Edgar, V. P.	New-Orleans, La.
Mississippi & Tennessee	M. Burke	M. Burk	Memphis, Tenn.
Mississippi Valley & Western	E. P. Buell		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas		G. M. Babcock	Sedalia, Mo.
Cherokee Division	L. H. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Holden, Mo.
Eastern Division	Mark M. Towne		Hannibal, Mo.
Sedalia Division	Mark M. Towne		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Heaning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	A. L. Rives	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Division	M. M. Miller		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada	John Stewart	Tho. H. Street	St. Andrews, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury	W. A. Waterbury	Middletown, Ct
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Hartford Division	C. S. Davidson		Hartford, Ct.
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Worcester Division	P. St. M. Andrews		Worcester, Mass.
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Northern Central	A. R. Fiske		Harrisburg, Pa.
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Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
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Middle Division	S. A. Black		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa
Bedford Division	W. H. Brown		Bedford, Pa.
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Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
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Philadelphia & Erie		Enoch Lewis	Philadelphia, Pa.
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Middle Division	Edmund L. Tyler		Renovo, Pa.
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Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
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Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
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Western Maryland	*J. M. Hood		Baltimore, Md.
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Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn	J. H. Stewart	Madison, Wis.
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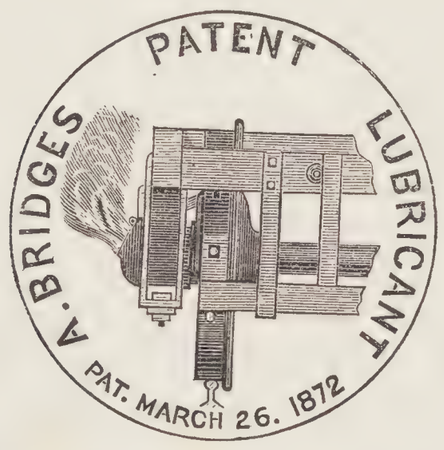

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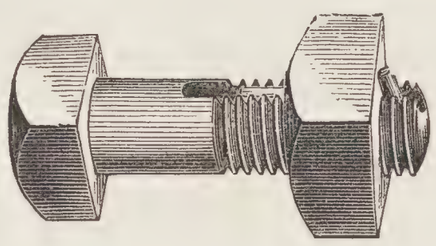
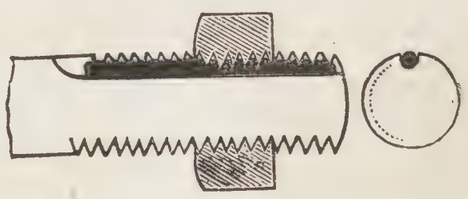


"CUMMING NUT-LOCK,"

Patented

June 16, 1868,

August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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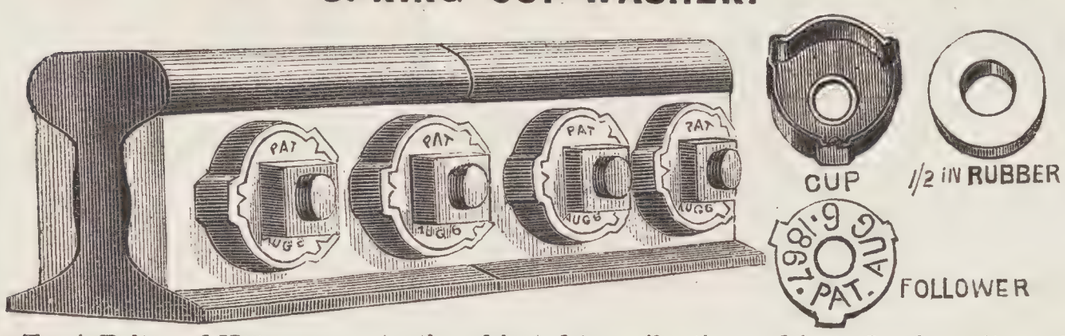
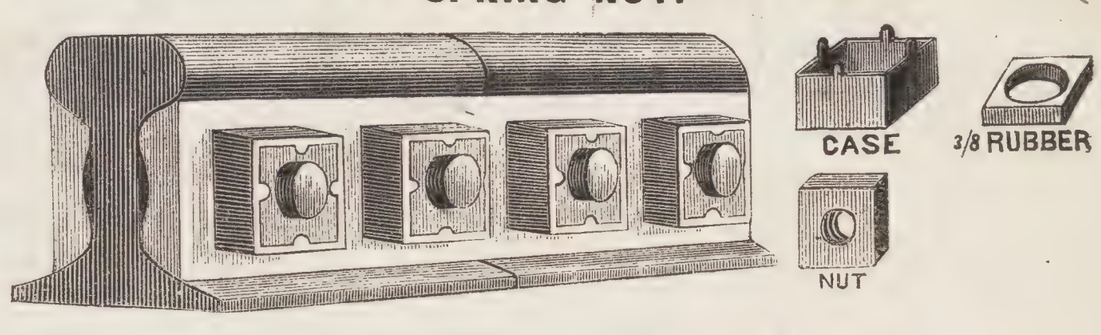


"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

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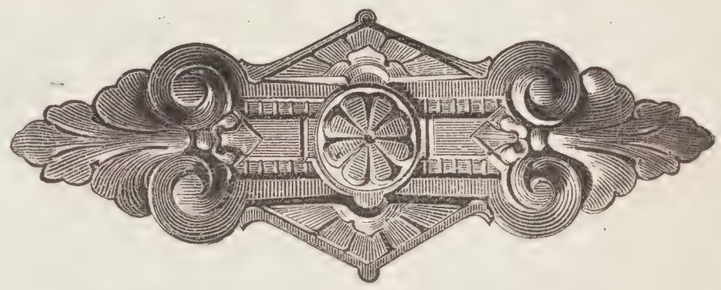

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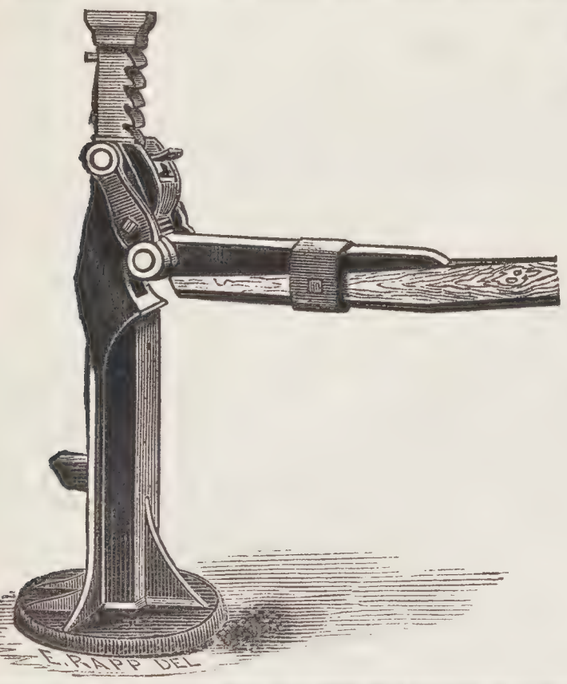

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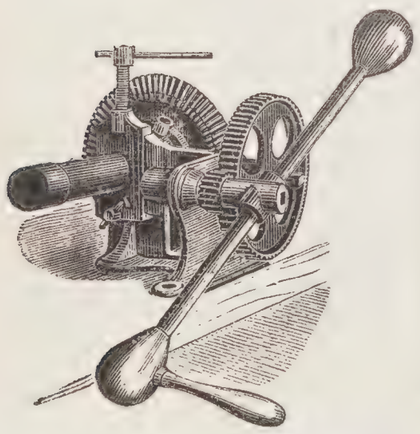

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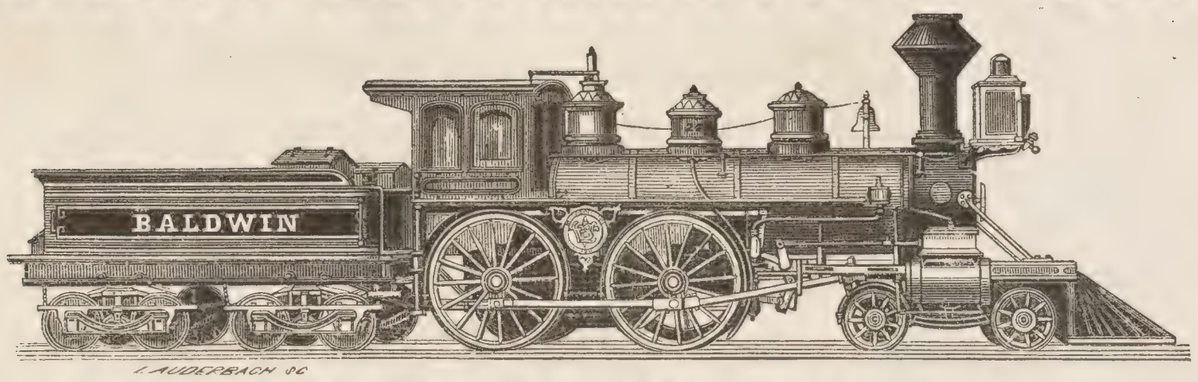

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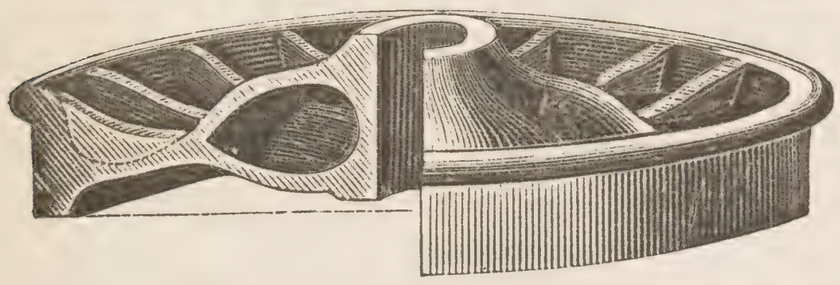

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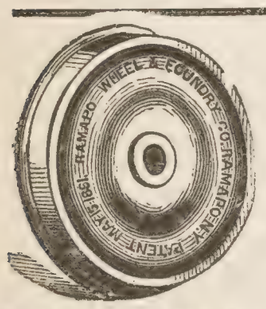

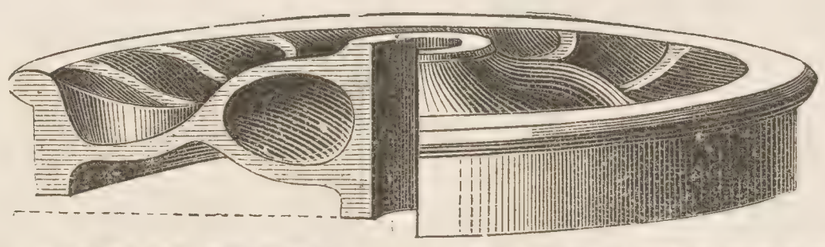

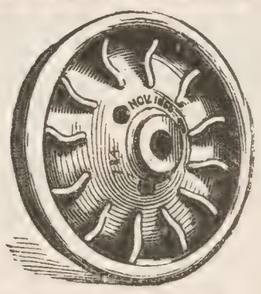

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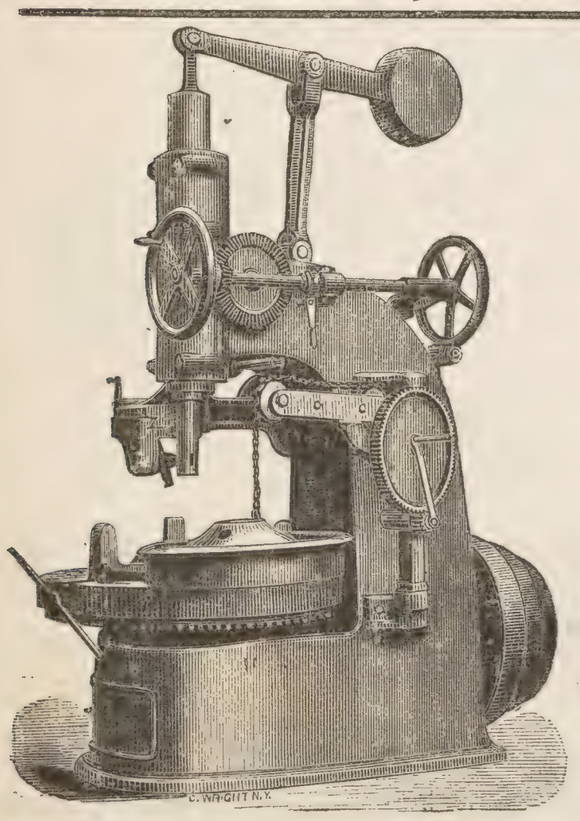

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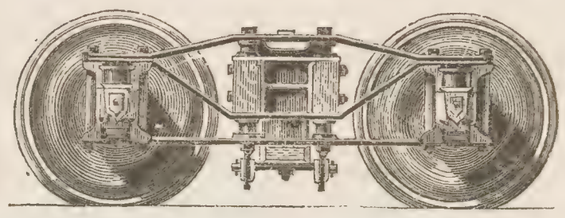

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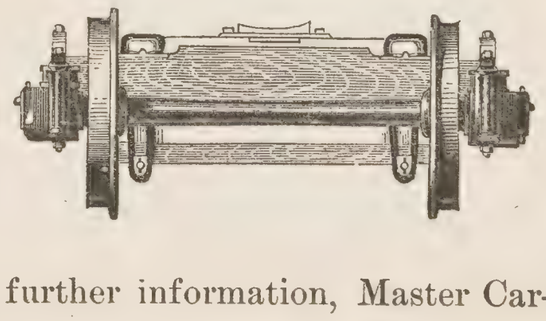

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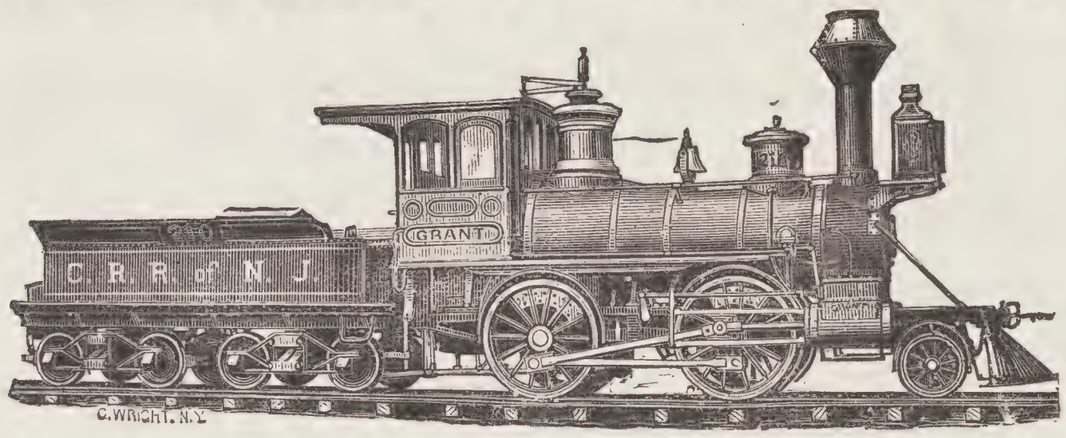

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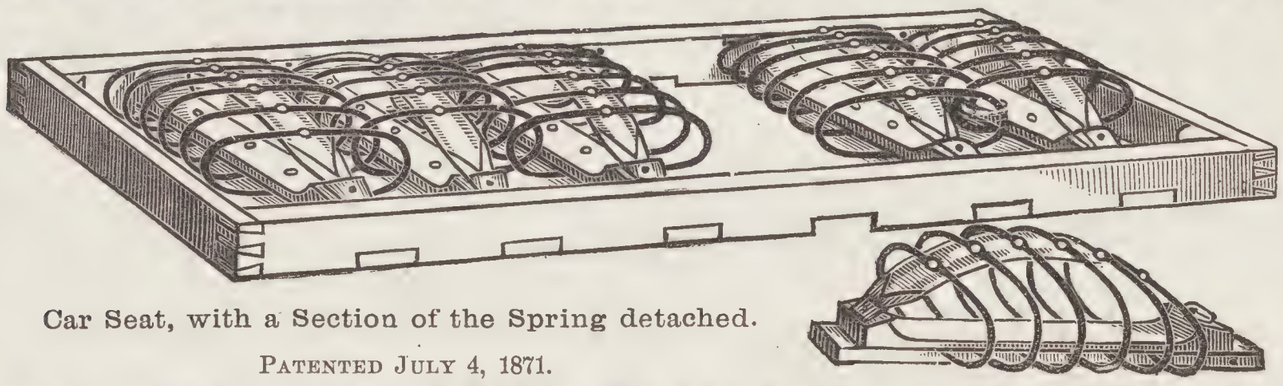

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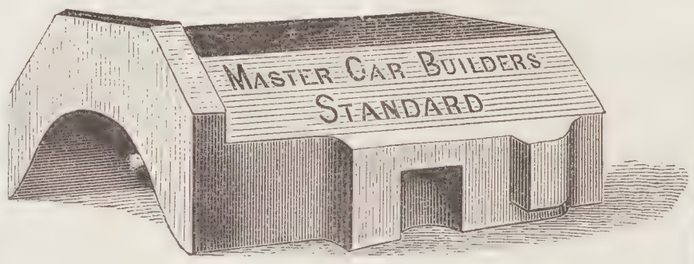

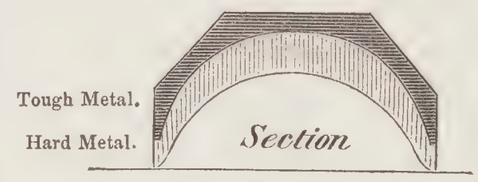

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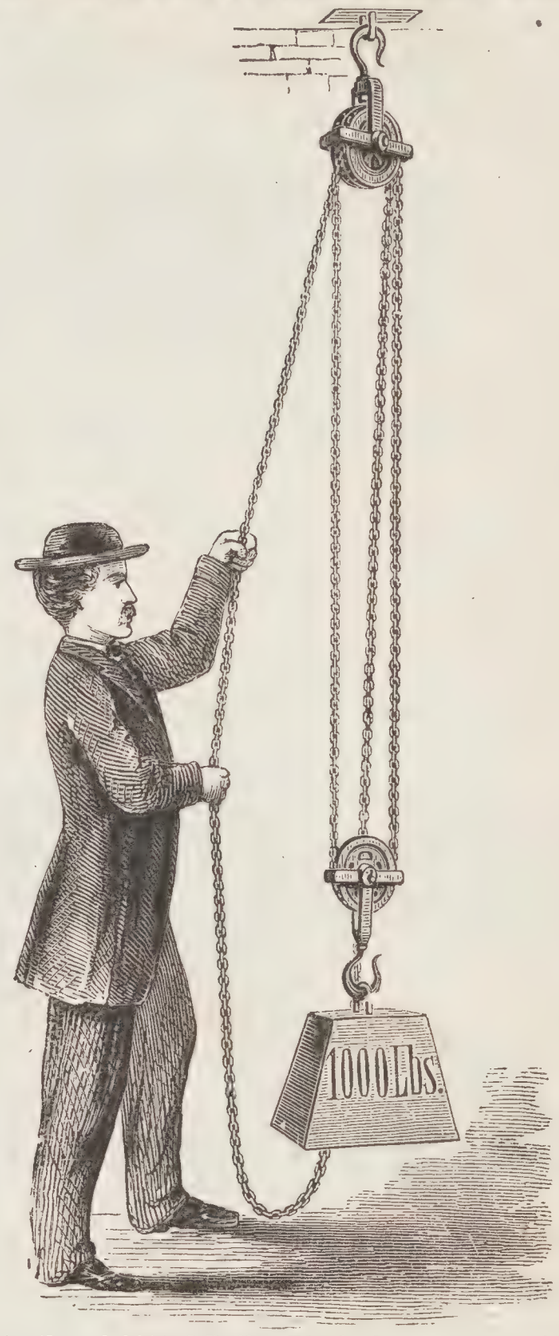

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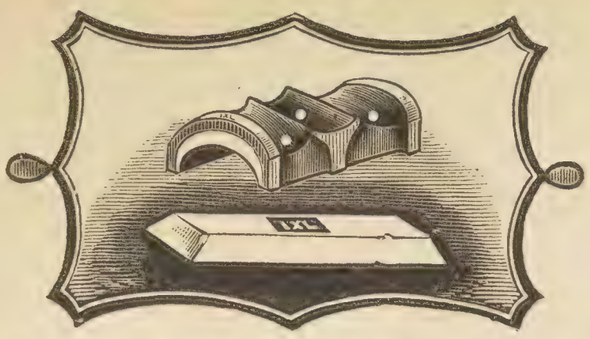

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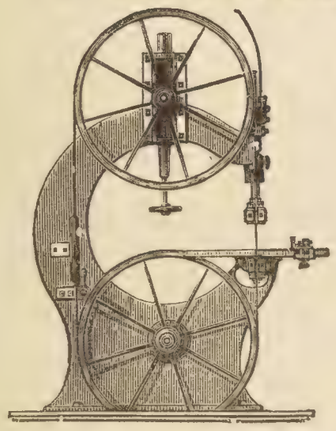

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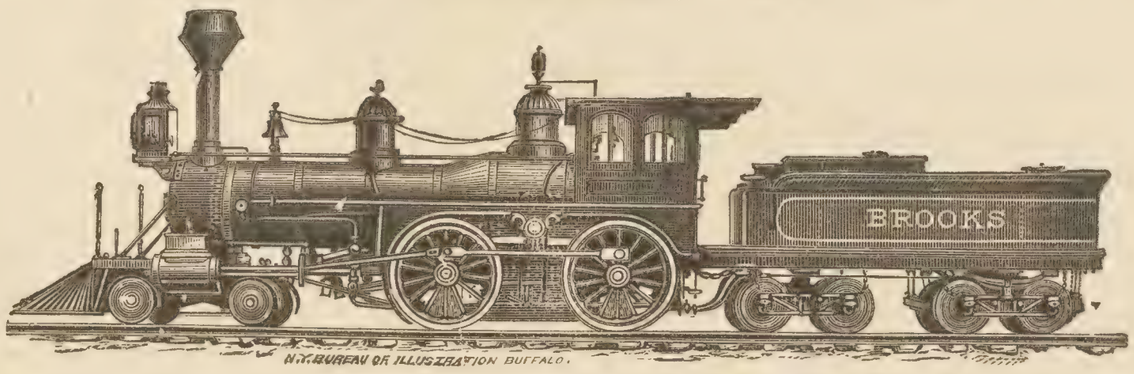

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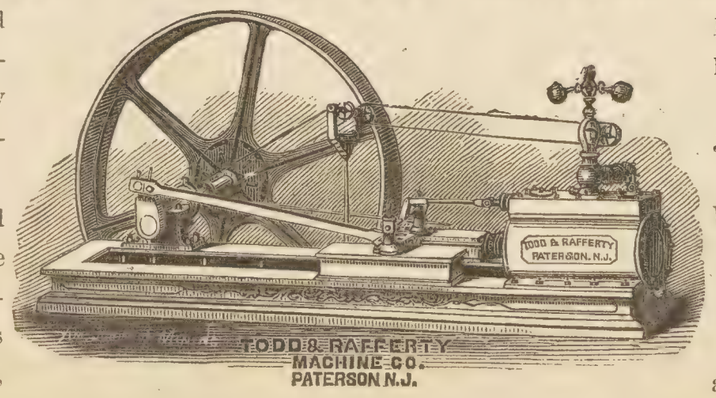

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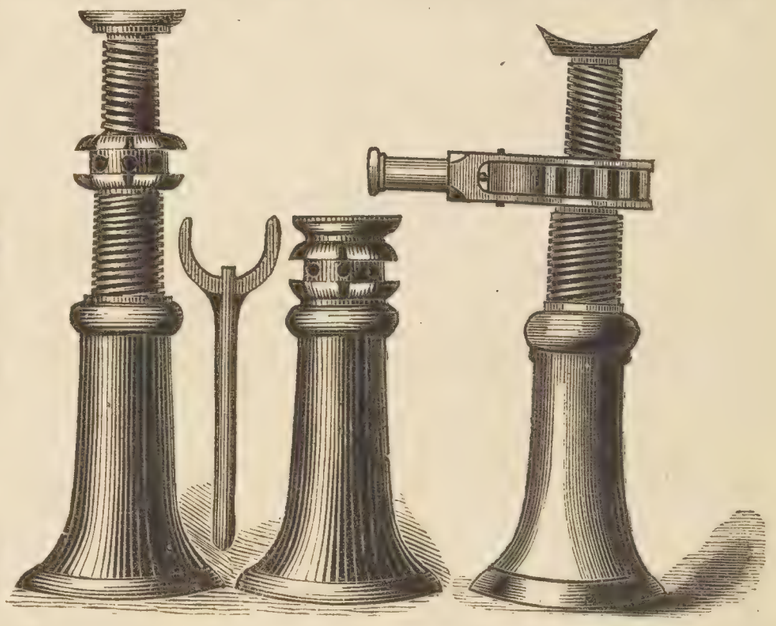

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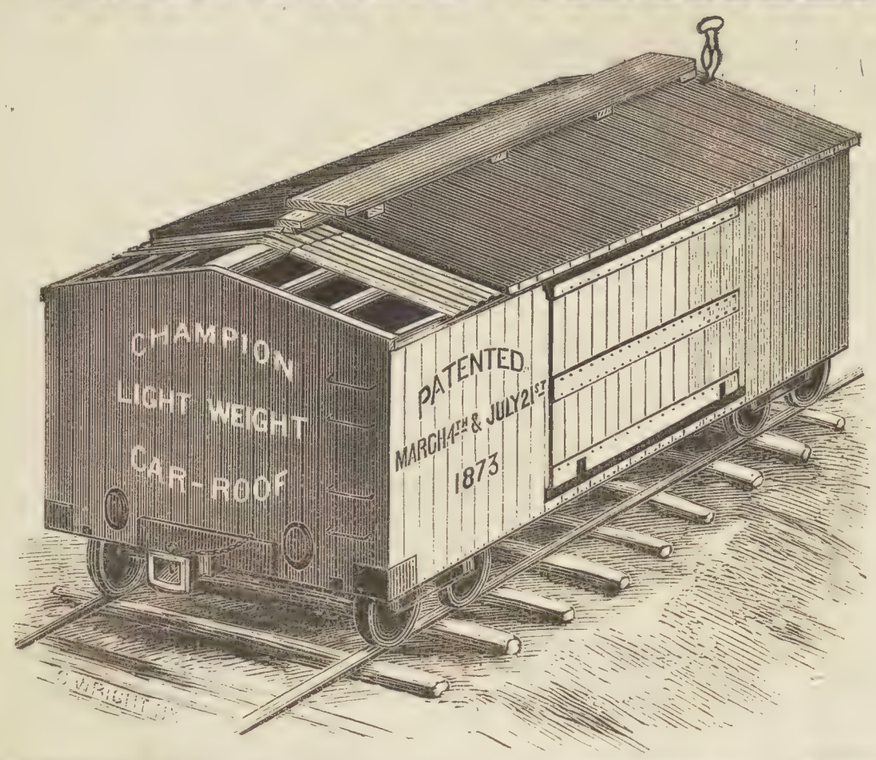

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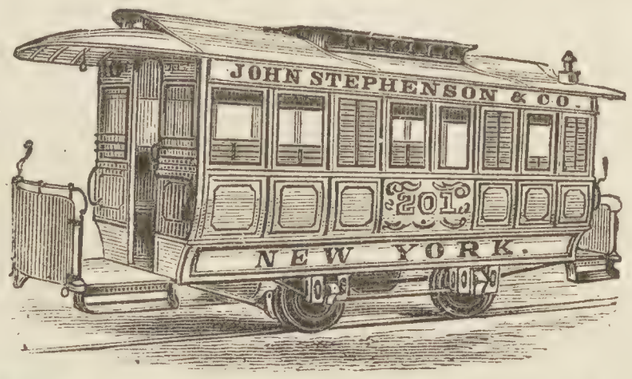

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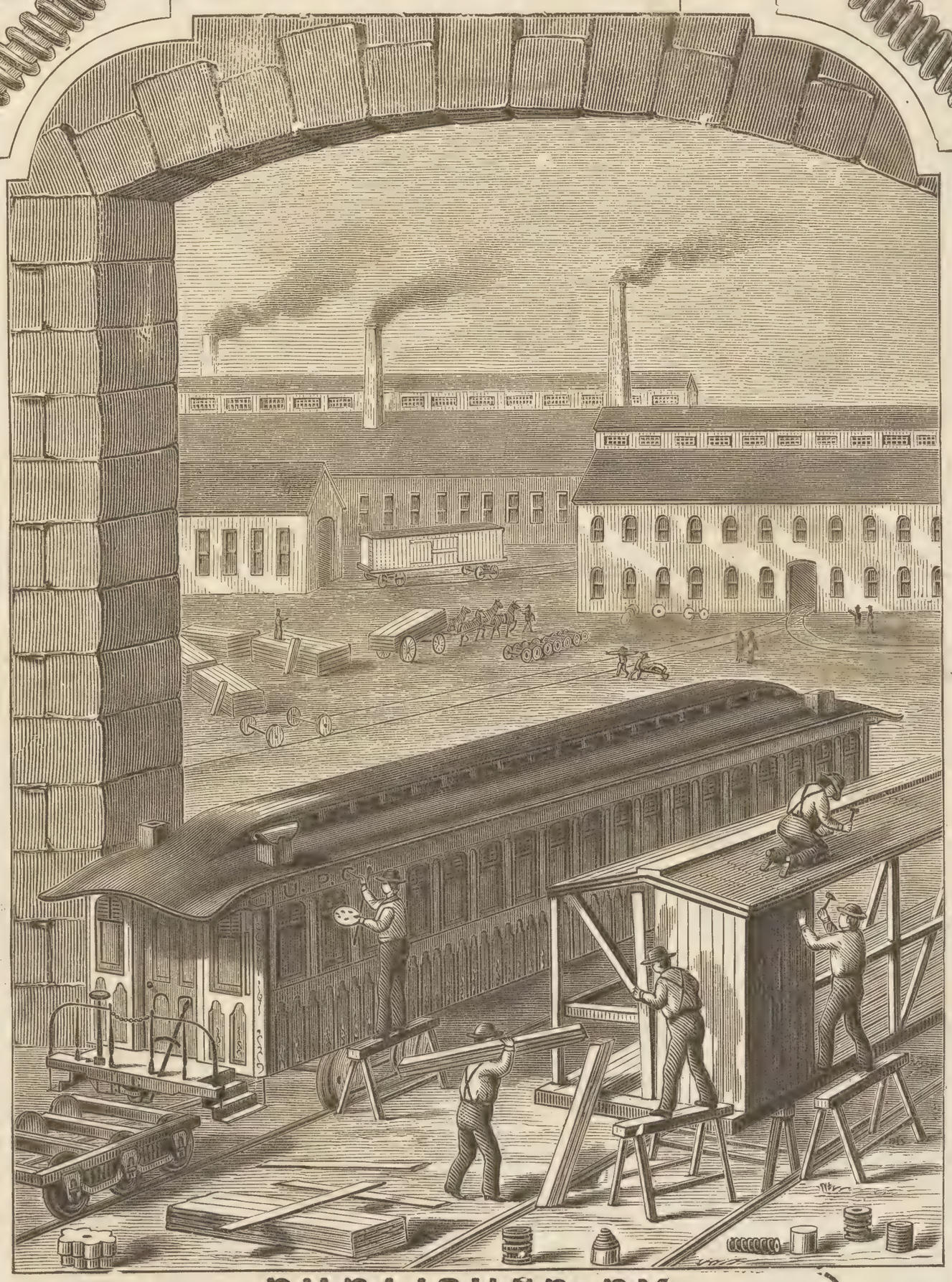
Vol. V. SEPTEMBER, 1874. No. 9.



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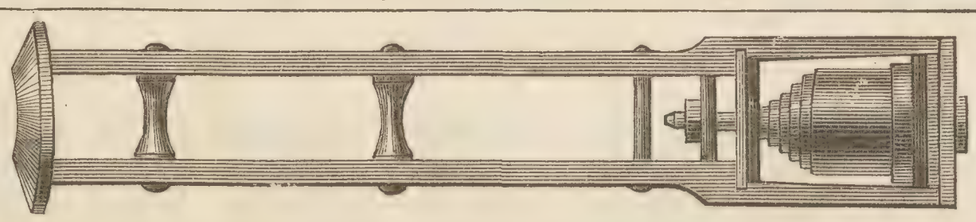

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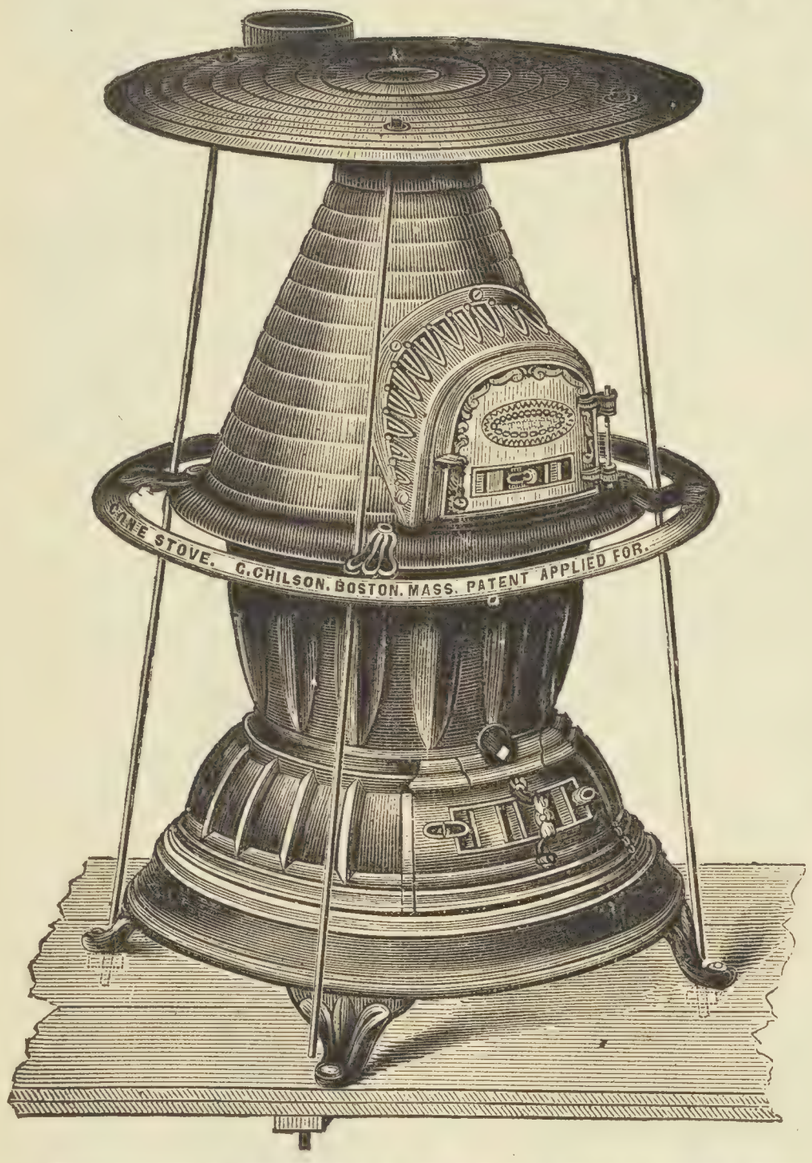
A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stove.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned*. I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

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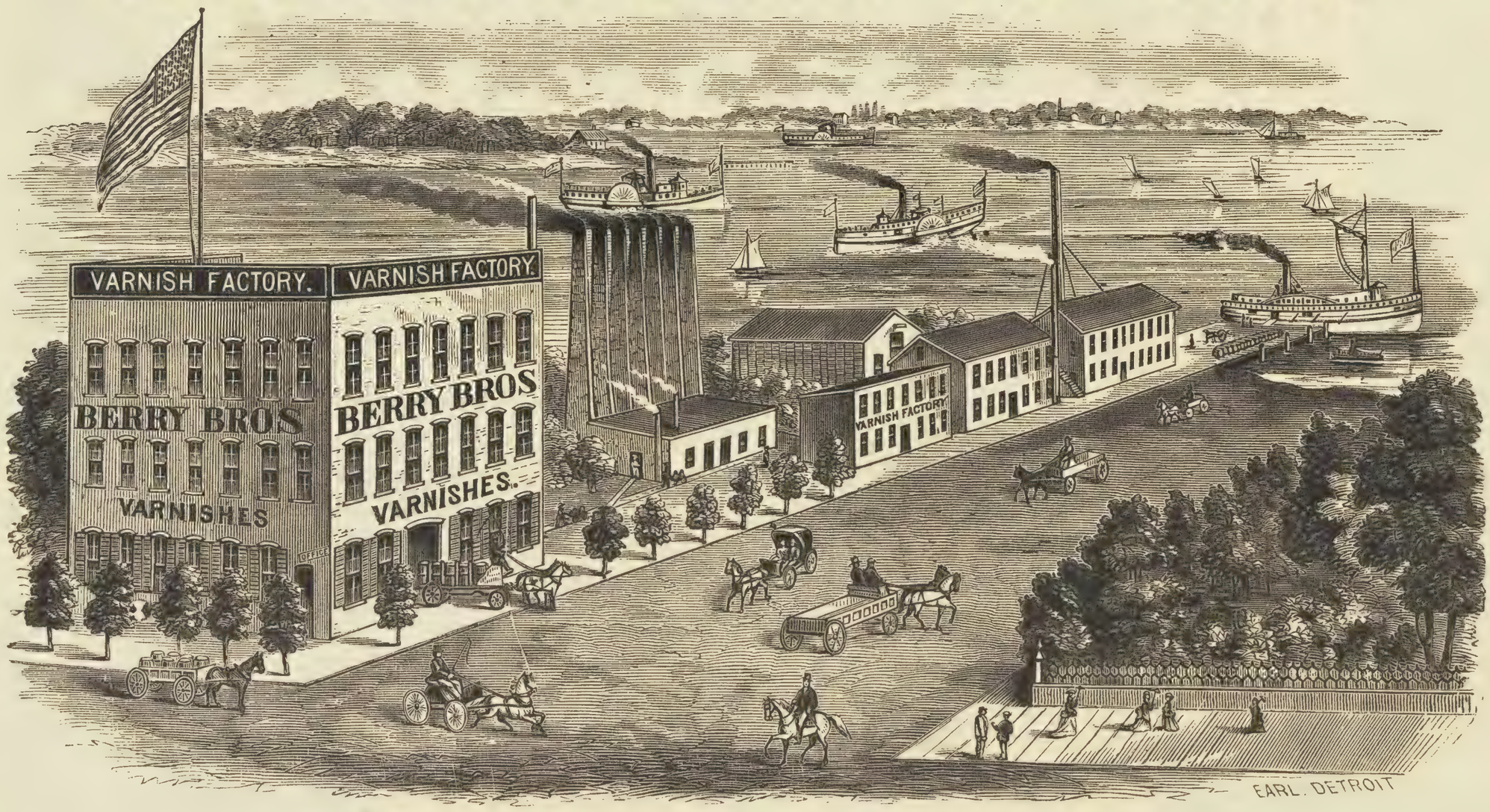

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Our tools are all made by improved machinery, designed for this purpose, and are made of the best selected cast steel.

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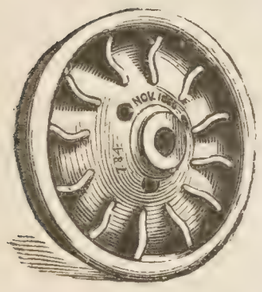

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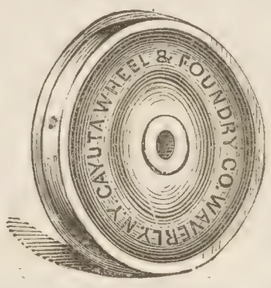
WHEELS



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WHEELS FITTED TO AXLES,

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CASTINGS for all kinds of CARS, MINE CAR WHEELS, ETC

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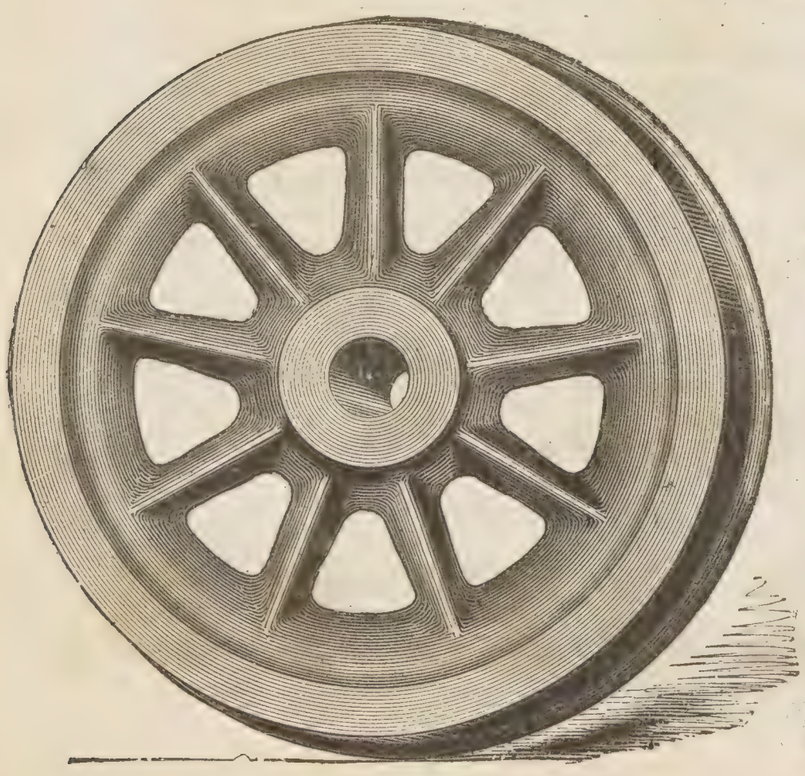

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This Company using strictly Baltimore Charcoal Iron, which has no superior and few equals, for making Car-Wheels,) and annealing their Wheels by the most approved process, warrant them free from strain, and equal in tenacity and uniformity of chill to any made.

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Patent Coupling,

FOR FREIGHT CARS.

First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins and links alone in a very short time, there being a link always in reserve, ready for use, without liability of being lost or stolen.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address ***William Todd,*** or

WILLIAMS, PAGE & CO.,

BOSTON.

Standard Car Axle-Boxes, Housings, and Jaws,

SUPPLIED TO ORDER BY

FOUNDRY AND MACHINE COMPANY,

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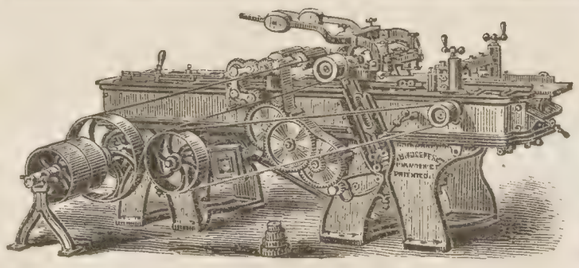
TWENTY-FOURTH AND WOOD STS, PHILADELPHIA, PA.

(Take Arch, or Race and Vine Street Cars.)

Steam Hammers, Drops, &c. Engine Lathes, Axle Lathes, Cut-off and Centering Lathes, Patent Screw-Cutting Lathes, Planing and Slotting Machines, Wheel Borers and Wheel Pressers, Upright Drills, with Patent Universal Tables, Radial Drills.



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Wood-Working Machinery

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Scale in Steam Boilers.

I WILL REMOVE AND PREVENT **SCALE** IN ANY STEAM BOILER, AND MAKE NO CHARGE UNTIL THE WORK IS FOUND SATISFACTORY. ADDRESS, GEO. W. LORD, PHILADELPHIA PA.

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Hitchcock Car Ventilator.

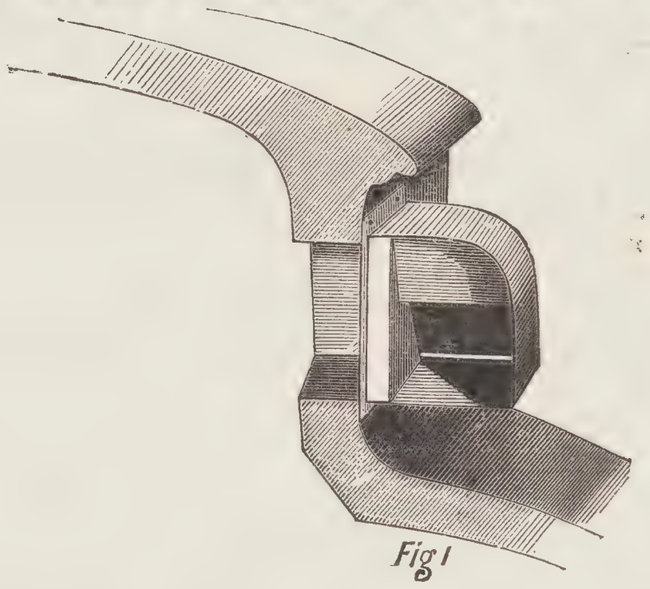


Fig 1

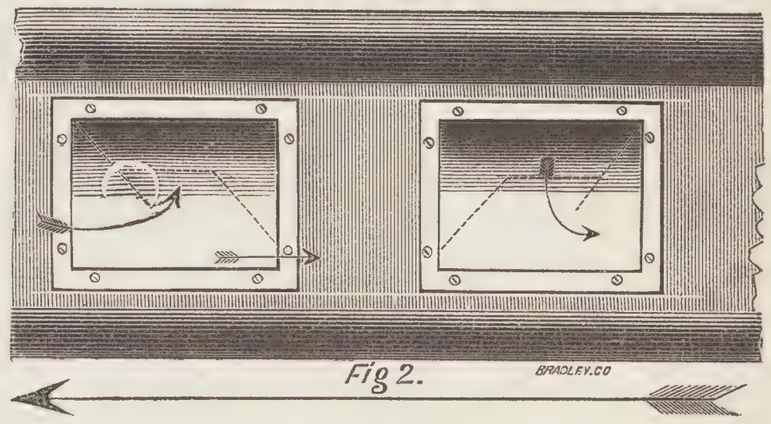


Fig 2. BRADLEY.CO

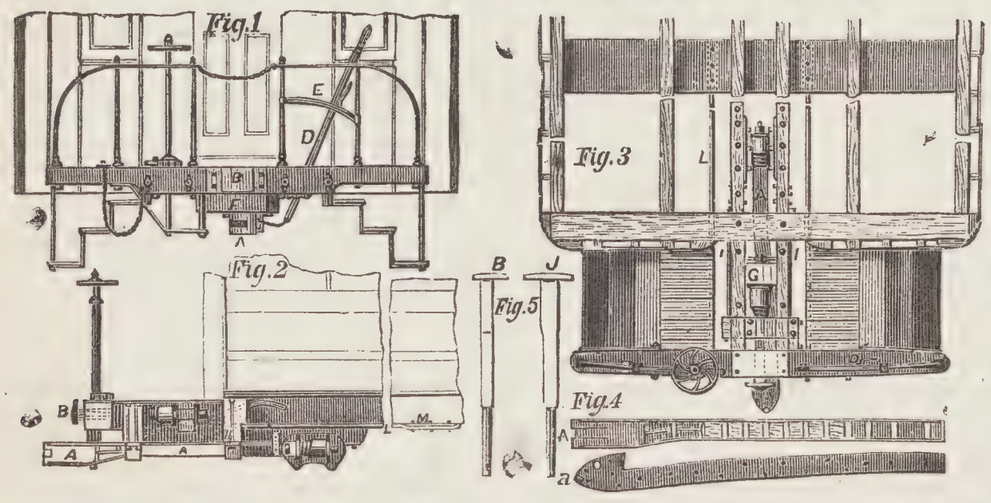
THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

H. D. CARROLL & CO., Springfield, Mass.,

Proprietors and Manufacturers.

ROBERT HITCHCOCK, Inventor.

MILLER'S TRUSSED PLATFORMS. Compression Buffers and Automatic Couplers for Railroad Passenger Cars.



Office, 231 Broadway, (Rooms 4 and 5,) New-York.

Send for Illustrated Pamphlet, and call and see working models. **E. MILLER, Patentee.**

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied; and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook' A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together. (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out: the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

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[Working Capacity, 1000 Men.]

Manufacturers of Sleeping, Saloon, Drawing-Room, Passenger, and Freight Cars of Every Gauge.

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A SITUATION AS MASTER CAR BUILDER, by one who is thoroughly acquainted with the business, and can give the best of references.

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THE
PETERSBURG CAR COMPANY,
Petersburg, Va.,

Are now ready to receive orders for all kinds of

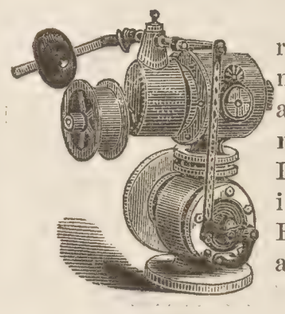
FREIGHT CARS.

These works are supplied with the most improved machinery, and have switch connections with broad and narrow gauge. They are prepared to furnish Rolling Stock with the utmost promptness, of the best materials and workmanship, and at the lowest prices.

T. L. H. YOUNG, President. JOHN W. FLEMING, Superintendent.

HUNTOON GOVERNOR,
FOR
STATIONARY AND MARINE ENGINES.

OVER FOUR THOUSAND NOW IN USE.



All Governors fully Warranted, and returnable in all cases where a trial does not prove its superiority over all others, as the **most Perfect, Reliable and Economical Steam Governor ever Invented.** It resembles, neither in principle nor in operation, any other Governor known. For Circulars of reference, or information, address

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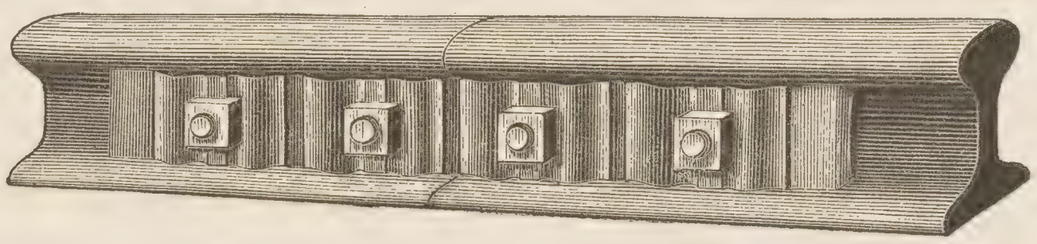
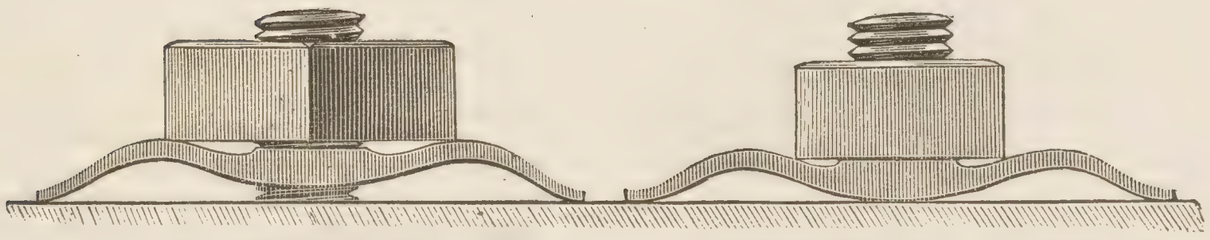
MILLER'S PATENT ELASTIC WASHER AND NUT LOCK,
FOR RAILROAD FISH JOINTS.





NUT SCREWED DOWN. SCREWED DOWN AND NUT LOCKED.

These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

Address *SWEETS MFG. CO., Syracuse, N. Y.*

ESTABLISHED 1827.

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JOHN A. ELMENDORF.

WANTED.

A GENTLEMAN of 20 years' experience as a "Car Builder," wants a position as Master Car-Builder on some Railroad. Can furnish best of references. Address

VOSE, DINSMORE & CO.,
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NOYES' PATENT LIQUID PACKING.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.

The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

FOR RAILROADS, AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Packing certain quantities of mineral oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather, an element that is lacking in mineral oil. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and mineral oil together. In cold weather, the combination is not so essential, but it will always be found economical to combine a small quantity of the Liquid with the mineral oil which is generally used upon railroads.

Where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes, and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used. We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

BOSTON, LOWELL AND NASHUA R. R. SUPERINTENDENT'S OFFICE,
P. NOYES, AGENT, BOSTON, April 13. 1874.

Dear Sir: We have been using your LIQUID PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq.,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent thickening; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Belt and Leather Stuffing Co., CHICAGO, Dec. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C. B. & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING same as purchased of you before, and send as soon as possible.

H. I. HIGGINS, *Purchasing Agent Quincy Railroad.*

CHICAGO, ILL., May 7, 1874.

AGENT BELT AND LEATHER STUFFING CO.:

Dear Sir: You will please forward to the C. B. and Q. R.R. ten barrels Liquid Packing.

H. I. HIGGINS, *Purchasing Agent C. B. and Q. R.R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.

J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq.: ALBANY, Nov. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report;

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.

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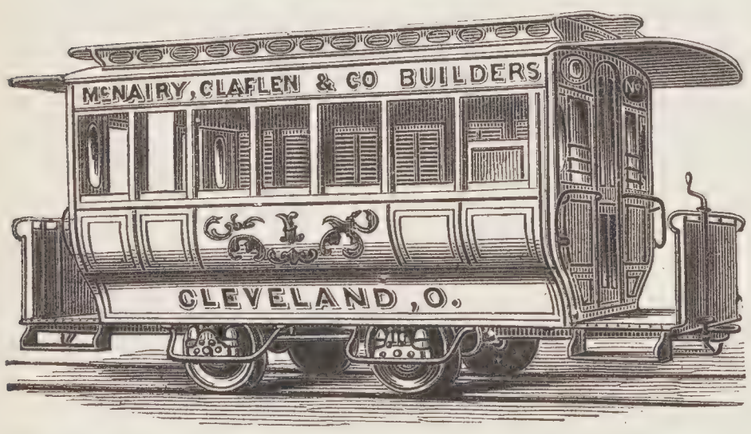

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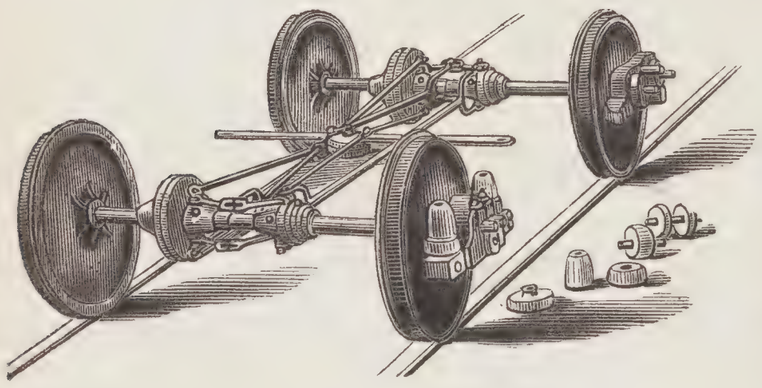

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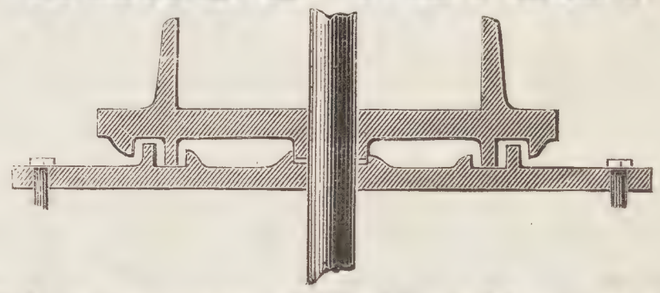

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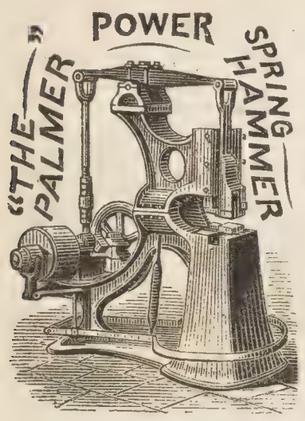

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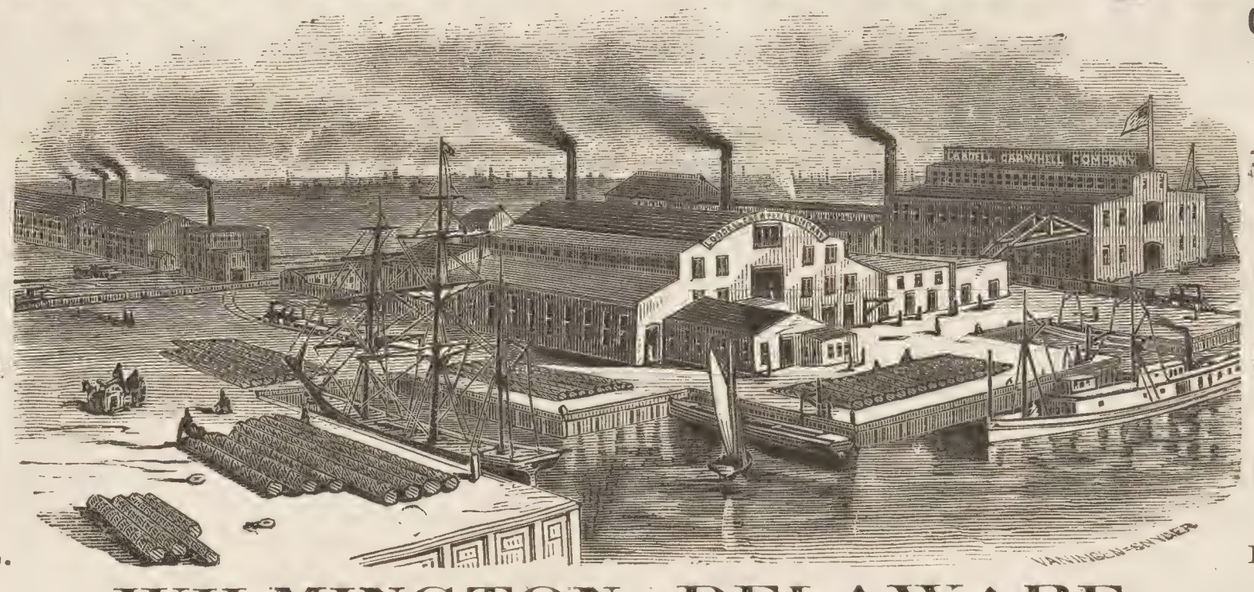

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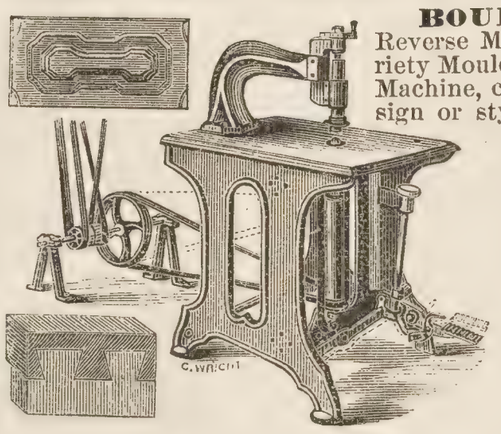

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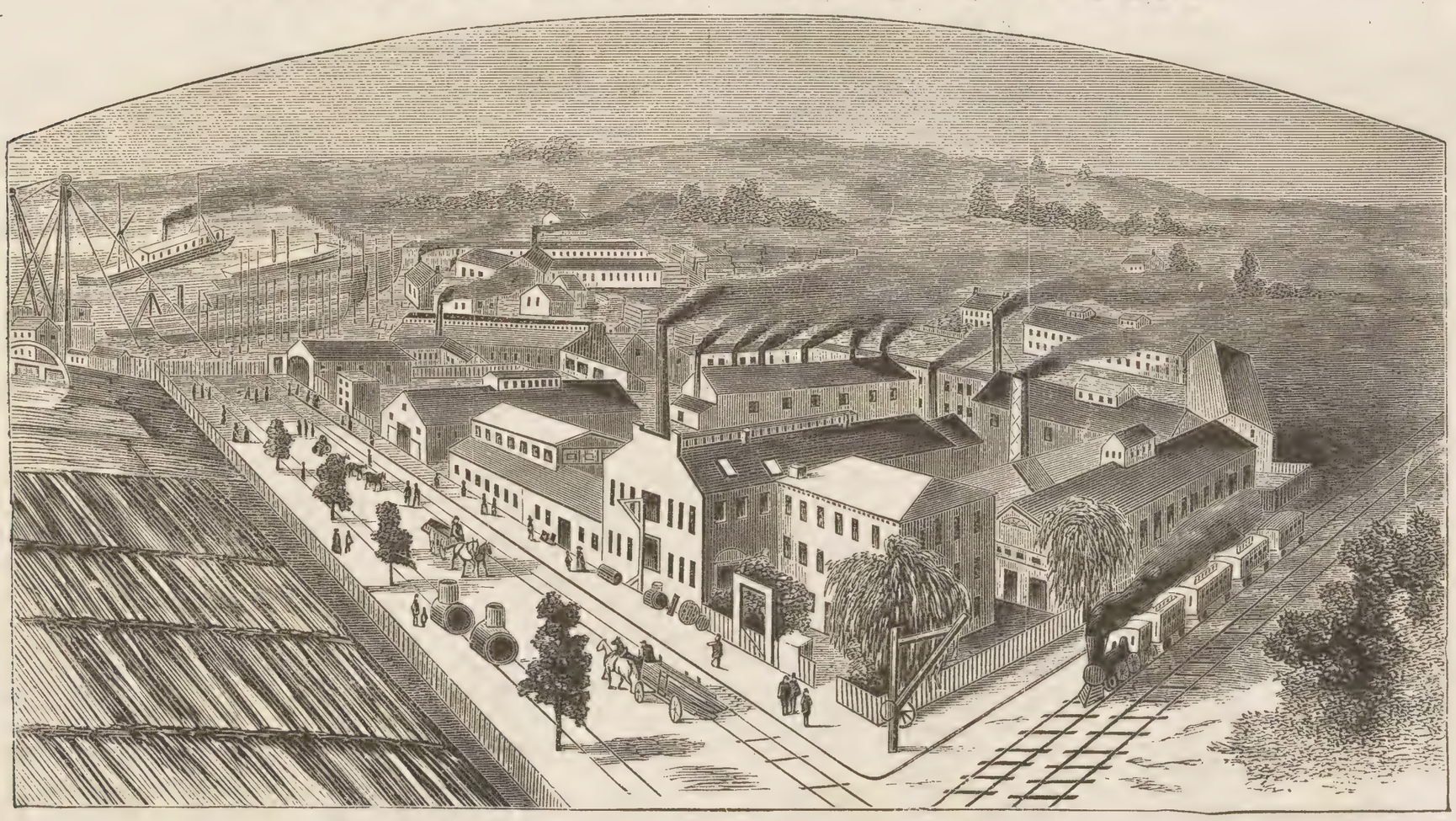

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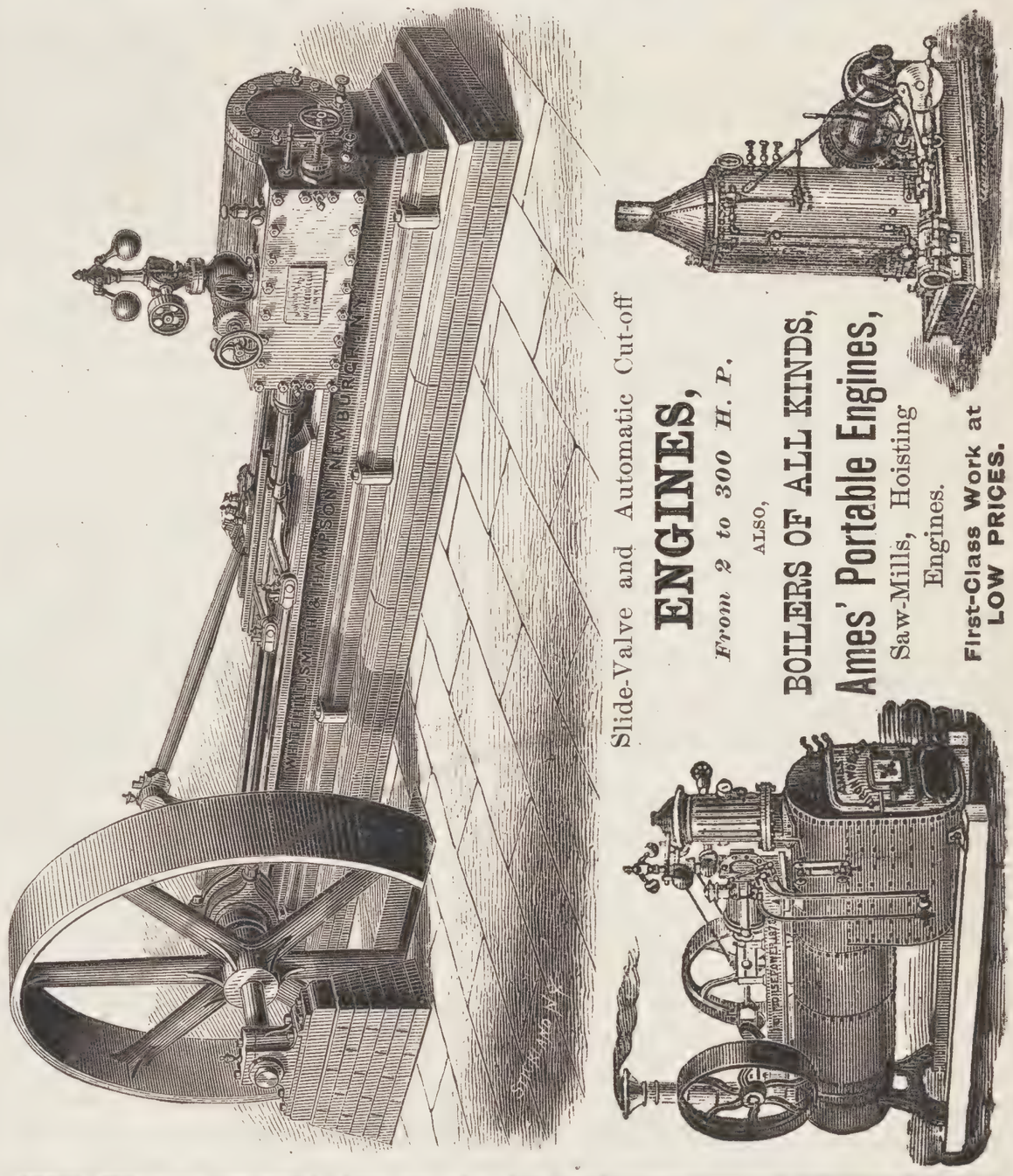

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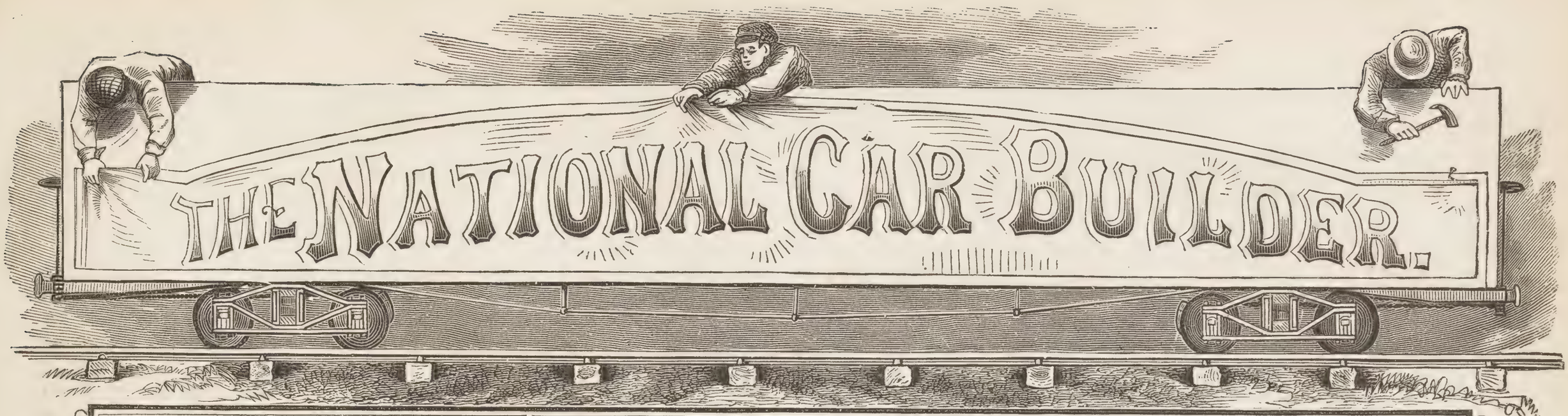

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The Form and Endurance of Rails.

At the late meeting of the American Society of Civil Engineers, the committee on the form, endurance, and manufacture of rails made a very lengthy report. Our space will admit only a summary of some of the leading points. The committee consider the rail as consisting of two parts, the consumable and the residual, the former consisting of the head or wearing part, and the latter of what is left after the head is worn off; the material of one should have wearing endurance, the other strength and stiffness. On English roads, where the rail supports are further apart than on ours and the wheels more heavily loaded, the residual part of the rail should be stronger and stiffer, while on our roads the endurance and wear of the consumable part, or head of the rail, is the most important consideration; consequently the experience of one country is not a safe guide for the other. The form and material of rails must be adapted to all the conditions of the roads on which they are to be used, embracing ties, ballast, road-bed, curves, grades, wheels, weight, etc. The causes of rail-fractures are classed into primary and secondary, the former originating in bad material and manufacture, unsuitable patterns, poor ballasting, and improperly laid ties; and the latter in a great variety of bad results proceeding therefrom.

Rails, as well as machinery, on each system of railroads, ought to be in uniform classes, each class proportioned to the traffic and other controlling circumstances. In violation of this obvious principle, it has been common for our railroad companies to pick up such rails as could be had at the lowest price, when the purchase could be postponed no longer, without much regard to form or adaptation, and with no knowledge, and scarcely a thought of their quality. When railroads are made to sell, this plan seems to answer the builders' purpose, whatever may be said of its honesty. Probably $20,000,000 or $30,000,000 a year are wasted in this country by such purchases, and many lives and limbs sacrificed.

Most forms of rail originated with or were modified by the rail-makers, who naturally adopted forms easiest to make, rather than those of greatest durability. Each material should be put in such form as best to avoid the dangers to which that material is subject. As material and manufacture improve, economical forms can be adopted which would formerly have been impossible in this country, or at least inadmissible. The best form for steel or good iron could not have been used with iron imperfectly welded.

The best form for standard rail sections for the railroads of this country, should be adapted to the material, to the fastenings and joints, to the foundation, to the traffic, and to other things. It should be such, after securing a reasonable surplus of strength, that where there is most wear there should be most metal to sustain it. The parts where there is no wear should be as light, within practical limits, as experience has shown to be safe.

Experience shows that all the wear, on a reasonably good rail, except in some vicious arrangements, is on the head, and upon it nearly all the force of the blows given by passing wheels is expended and exhausted. As much of the metal as possible should be put there where it is most wanted. A steel or good iron rail with good foundations and fastenings and splices, and the weight on the wheels properly proportioned to the hardness of the rail-top, finally becomes unfit for service only by wearing down the top; except on curves, and where the wheels have too much or too little play between the rails, by abrasion of the flange on the running side of the head. With such conditions, the duration of the rail is measured by the amount of wear the head can endure, or the sectional area of the metal that can be worn away without weakening the rail too much—that is, the consumable part of the rail.

The head should be broad on the top to give as much wearing surface as possible. It has been erroneously supposed that it does no good to make the head more than about 2¼ inches wide, because the coning of the wheels prevents more than that from being used. But an examination of rail-surfaces nearly 3 inches wide shows that in fact they are evenly worn all over, forming nearly a plane surface slightly inclined downward toward the running side; that the top of the head is actually widened by the spread of the metal on the outside, and that the part so pressed out is also run upon and utilized. Whatever may be the contour of the face of the wheel at first, it wears into such form as to bear all across a wide rail.

Not only is the amount of wearing surface in a broad head greater than in a narrow one, but a square inch of the former endures more than a square inch of the latter. The area of contact between a given wheel and a wide surface averages greater than that between the same wheel and a narrow one. The more the weight is diffused and the less the pressure per square inch, the greater the tonnage each square inch will carry. Injury increases faster than weight on a given space—after reaching a certain point, many times as fast. Probably 100 tons, with a weight of 12,000 pounds on a wheel, would injure an iron rail as much as many thousands of tons with 3000 pounds on the same wheel. So a broad head gives more surface for adhesion without injury. A rail with a head 1¼ inches wide and 2½ deep would, with very light machinery, last longer than if the head was 2½ inches wide and 1¼ deep; but with machinery as it is, not half as long.

The stem has generally been made unnecessarily thick. Experience with many thousand rails under a heavy traffic during the last eight years has shown that a thickness of one half inch of iron and seven sixteenths of steel does not perceptibly compress nor bend sideways, nor with a good fish-joint, or any other good joint, give out in any other way. The stem should not be made thick for the following reasons: Being near the neutral axis, it adds little to the strength; it wastes material and unnecessarily increases cost. It is more difficult to put poor metal into a slender stem. It sometimes makes the rail too rigid, and so increases the wear of the head and the liability to break. With a given width of head, the thinner the stem the wider the bearing of the fish-plate under the head. When the head becomes elongated by hammering and crushing its surface, a thin stem yields more than a thick one, and so does not transmit so great a longitudinal strain to the base.

The base should be broad, so as not to cut into the cross-tie. Four inches does very well for good white-oak ties, covering full 30 per cent of the ground under the rail; but is insufficient with chestnut or other ties of soft wood, unless, like cypress, it is very elastic. With soft-wood ties on a road with heavy traffic, they should cover 40 per cent of the ground under the rail, or the base should be 4½ inches wide, or even more. This width, formerly impossible, or very difficult without great thickness or permanent strain in cooling, can now be attained with good metal without a great increase of weight. One-eighth inch thickness at the edge is sufficient to transmit the pressure to the tie without risk of breaking. The most important relations of the breadth of base are not with the strength of the rail, or with its height, but with the amount and hardness of the timber under it. Experience once showed that rails 7 inches high with about half that breadth of base did not upset. The preponderance of weight on the running side of the head is more than enough to counterbalance the centrifugal force on curves.

The base should be thin, because when the consumable part of a steel or good iron rail is nearly worn off (at which time the question of strength becomes prominent) even the thinnest base is heavier than the residuary head. Not only so, but part of what is left of the head being compressed, the other part is permanently strained, and hence is liable to break over a tie. Metal, for strength, should, therefore, be put into the head rather than the base. A rail generally breaks, not from weakness of the base, but from injury to the head. A thin base saves metal and cost. Only good metal can be put into it. It prevents too great inflexibility. It is notorious that very rigid rails are more liable to break than those moderately flexible. Instead of conforming to the slight irregularities and undulations of our American foundations, a rigid rail can neither carry the weight between points so far apart as those it is liable to rest upon, nor bend down to some intermediate support.

The relative weights of the many conflicting considerations in favor of high and of low rails can be known only by experience. A high rail is more rigid, and therefore the head wears out faster, and under some circumstances the rail is more liable to break. The heads of the rails 7 inches high did not wear nearly as long as the same sized heads on lower rails. On the other hand, a low rail does not give sufficient width to the fish-plate, brings the flange of the wheel

in contact with ice and dirt, and, if very low, is not stiff enough. Experience seems to have sanctioned a height of about 4½ inches for rails of 60 pounds weight per yard, and over 4 inches for those between 50 and 60 pounds, and 3½ inches for those under 50 pounds. Many who once strongly objected to these heights now adopt them.

The reasons for light base and stem, and for putting all the metal possible in the head, suggest the question, why not make all head? In other words, why not use a rail, say 2½ inches square, which would weigh about 63 pounds to the yard? Besides the inconveniences of so low a rail and the greater risk of poor metal, it would be too flexible—if not at first, certainly when partially worn; while the rail with stem and base would be stiff enough when much more worn; and with so narrow a bearing, the square bar would cut into the tie, and the connections would be unsatisfactory.

In the patterns of rails hereinafter recommended, the head contains 45 to 50 per cent of all the metal. We prefer 50 per cent to anything less, except for a road but little used. On such a road the rail must be nearly as strong as on any other, but wearing endurance is not required.

Experience has shown that the thickness commonly adopted for stem and base is from one to three sixteenths inch more than is necessary, adding a nearly useless weight of about 8 per cent to the weight and cost of the rail; or, perhaps, $30,000,000 to the cost of the rails now laid in this country. As rails often break from punching the stems and slotting the bases, and the fracture begins in those parts, we may fairly be asked if this danger would not be diminished by making them heavier. Doubtless it would; but that would be a very expensive way of diminishing the danger, while it can easily and cheaply be prevented by proper fishing with a long stiff fish-plate extending far past the last hole in the direction of the middle of the rail, with broad plane surfaces of contact between rail and plate, with flat slopes of shoulders, in which case the bolts and nuts do not work loose, the plate bears the head and the weight on it, and carries it to a distance from the ends of the rail, and the rest of the rail, near the end, has nothing to do. With other than fish-joints, we admit, there is some weight in this objection.

Bolt holes should be drilled, not punched, through the stem. The base should not be notched at all, but the rail held from traveling longitudinally by straps connecting fish-bolts and ties.

In regard to the comparative value of iron and steel rails, the report says: While steel rails as we get them are tolerably uniform in quality, iron varies so much that no comparison can be made except of particular qualities or of averages of qualities widely different. We can as yet do little more than give the results of our own experience. In so doing, we shall not only compare steel and iron, but also the effect of some different circumstances on the duration of bolts.

It seems probable that the best iron, if homogeneous and the head of uniform hardness, so as to wear off evenly, like steel, would, with machinery of moderate weight, wear a third or even half as long as steel. The Chairman has found that his 62 pounds iron rail, after carrying about 14,000,000 tons gross load, has worn off only about 25 per cent more than the steel rails on the same track and under the same circumstances. Probably it will not wear so when the top crust is worn through. But owing to want of homogeneousness and uniformity, the iron scales, splinters, laminates, or somehow disintegrates or mashes in spots before it wears out.

A steel rail may last five or ten times as long as a really good iron rail, fifteen or twenty times as long as those that pass for good, thirty or forty times as long as the common run, and fifty or even a hundred times as long as many rails made ten years ago, or since imported from the cinder-heaps of Great Britain.

Case-Hardening Iron.

We copy the following from an article on practical mechanism, by Joshua Rose, in the *Scientific American*: "Iron may be case-hardened, that is, the surface converted into steel and hardened, as follows: First, by the common prussiate of potash process, which is as follows: Crush the potash to a powder, being careful that there are no lumps left in it, then heat the iron as hot as possible without causing it to scale; and with a piece of rod-iron, spoon-shaped at the end, apply the prussiate of potash to the surface of the iron, rub it with the spoon end of the rod until it fuses and runs all over the article, which must then be placed in the fire again and slightly reheated, and then plunged into water, observing the rules given for immersing steel so as not to warp the article.

"Another method is to place the pieces to be hardened in an iron box, made air-tight by having all its seams covered well with fire-clay, filling the box in with bone-dust closely packed around the articles, or (what is better) with leather and hoofs cut into pieces about an inch in size, adding thin layers of salt in the proportion of about 4 lbs. salt to 20 lbs. of leather and 15 lbs. of hoofs. In packing the articles in the box, be careful to so place them that when the hoofs, leather, etc., are burned away, and the pieces of iron in the box receive the weight of those above them, they will not be likely to bend from the pressure. When the articles are packed and the box ready to be closed with the lid, pour into it one gallon of urine to the above quantities of leather, etc.; then fasten down the lid and seal the seams outside well with clay. The box is then placed in a furnace and allowed to remain there for about 12 hours, when the articles are taken out and quickly immersed in water, care being taken to put them in the water endways to avoid warping them.

"Articles to be case-hardened in the above manner should have pieces of sheet-iron fitted in them in all parts where they are required to fit well and are difficult to bend when cold. Suppose, for instance, it is a quadrant for a link motion: fit into the slot where the die works a piece of sheet-iron (say ¼ thick) at each end of the slot, and two other pieces at equidistant places in the slot, leaving on the pieces a projection to prevent them from falling through the slot. In packing the quadrant in the box, place it so that the sheet-iron pieces will have their projections uppermost; then, in taking the quadrant out of the box, handle it carefully, and the pieces of iron will remain where they were placed, and prevent the quadrant from warping in cooling or while in the box (from the pressure of the pieces of work placed above it).

"It is obvious, from what has been already said, that the heavier pieces of work should be placed in the bottom of the box."

Difficulties of Railroad Construction.

A condensed sketch of the difficulties and dangers attendant upon the construction of a single line of railroad will better illustrate the qualities which go to make a successful railroad contractor, and the nature of his work, than any general description. From Aspinwall to Panama there runs a line of railroad across the Isthmus which bears the latter name. It is not a long line; its length is but 47 miles and a fraction. It is not of difficult grades. Its highest point is but 263 feet above tide-water, and its maximum grade is 60 feet to a mile. Yet this single, and in size comparatively insignificant railroad, involved the construction of 134 minor water-ways and 36 bridges, the latter ranging from 12 feet to 625 feet in length. The construction of this road occupied five years and nine months. It commenced at Aspinwall, in the heart of a swamp. The laborers had to clear their way through the tangled underbrush of a tropical forest, thigh-deep in water, subject at any moment to the attacks of alligators and other not less dangerous though less formidable reptiles, and enveloped in a cloud of flies and mosquitoes. Every workman went to his labors veiled. Residence on the land was impossible. An old brig anchored in the bay served the purpose of barracks. The constant motion of their prison-ship subjected the landsmen to continued nausea by night, which but illy fitted them for toil by day. The malarious fevers of the country converted their movable barracks into a hospital ship. The two engineers in charge took turns in the fever with the men, the least disabled rising from the hospital bed to give place to his companion. Natives were lazy, and would not work. Imported laborers from the north sickened and died in such numbers that the work actually stopped for want of hands. The importation of Chinese coolies proved an unsuccessful experiment, for melancholy and suicide thinned out their ranks almost as fast as malarious fever the ranks of their braver comrades. The house of the first engineer was built on the tops of stumps to keep it above the water-level. The freshets which swell the Chagres river, sometimes in a single night to a height of forty feet above its ordinary level, carried away the nearly completed bridge which was to span it. Twice the road was contracted for, and twice thrown back upon the company's hands before it was completed so far as to enable a locomotive to pass over it from ocean to ocean.—*Harper's Monthly.*

The Henderson Hydraulic Car-Brake.

A trial of this brake was recently made on the West Chester and Philadelphia Railroad, under the inspection of a committee of experienced engineers and mechanics. The train consisted of a locomotive, tender, and five passenger cars. The rails were wet and slippery, a rain having set in just as the train started, and all the stops were made under this disadvantage. The first stop was made on a down-grade of 15 feet to the mile, speed 35 miles an hour, steam shut off, and train stopped in 20½ seconds, distance 630 feet, boiler pressure 105 pounds. Second stop on same grade, steam shut off, speed 32 miles an hour, in 20 seconds, distance 540 feet, pressure 115 pounds. Third stop on level grade was made in 28½ seconds, distance 840 feet, pressure 105 pounds, signal-flag thrown from end of rear-car, bell-rope pulled, steam shut off, engine working in forward gear, speed 35 miles per hour. Fourth stop on level grade, signal from engine, steam shut off, in 19½ seconds, distance 540 feet, boiler pressure 120 pounds, speed 35 miles. The committee certify the brake to be extremely simple, inexpensive, and not liable to derangement, and that all the stops were made easily without jolting or concussion.

The construction and operation of the brake are described as follows: Between the wheels of each truck is placed a cylindrical vessel of cast iron, whose ends are formed of two dish-shaped flexible diaphragms of india-rubber, secured to the drum, and making an air-tight joint at the periphery by flanges bolting thereto. Two rams working in opposite directions are fitted against and into the hollow part of the diaphragms, their outer ends are attached by rectangular flanges and bolts to the brake-beams carrying the brake-shoes. The several castings are simply bolted together, with the diaphragms, as they come from the foundry, without recourse to the usually expensive mechanical fittings. When pressure comes between the diaphragms, it simply forces them apart, projecting the rams, which act immediately on the brake-beams, applying the brakes; and when the pressure is relieved, the atmosphere reacts on the area of the rams and forces them back, assisted by the tendency of the diaphragms themselves to recover their normal condition. The peculiar construction possesses all the requirements of a cylinder and working piston, as well as recoil springs. All piston-packing and stuffing boxes are dispensed with, and no lubrication is required; the interior is sealed from dust, all complication of levers and rods and attendant lost motion is done away with, and its operation is free from all connection with the usual hand-brake gear, which remains as efficient as it was before. When the brake-shoes are arranged on the outside of the wheels, as on the

above-named road, one of the diaphragms and rams is dispensed with, and the casting is bolted directly to the outside of one of the brake-beams. Action and reaction being equal, when pressure is applied, the casting presses one way and puts its brakes on, and the ram going outward draws the opposite brakes on by means of two rods attached to the head of the ram, and connecting with the other brake-beam.

The power is derived directly from the boiler of the locomotive. The device employed to transmit this power to the pressure-boxes just described consists of an hydraulic press operated by a double-acting steam cylinder, the valve of which is worked by the engineer. There is a piston in each; steam actuates the one to force the water from the other, thus creating hydraulic pressure on the pressure-boxes, and to withdraw the same to release the brakes. An air cushion is provided above the press piston to prevent striking the heads when coming back light. The press receives water from a tank, which may be the engine-tank or a special tank provided for the purpose, through a pipe furnished with a check-valve opening toward the press cylinder in such a manner that the fluid can not return to the tank; the supply is arranged to feed automatically; any excess or leakage past the press piston is at once returned to the tank. For low temperatures, a mixture of equal parts of glycerine and water is used in lieu of water, which is safe to 30° Fahr. below zero. Iron pipes are used under the cars with flexible hose between them, furnished with hydraulic couplings, which it is obvious must be tight both with and without internal pressure, a peculiarity possessed by this coupling alone.

Railway companies can be supplied with the device by applying to the Henderson Hydraulic Car-Brake Company, 119 South Fourth street, Philadelphia.

A NEW device for registering the fares of street railroads has been introduced in Philadelphia. It is a portable receptacle for money or tickets, and resembles in size a large powder-flask. It has two spring registering apparatuses, one to keep account of the fares deposited, and the other to register transfer tickets received from a branch line. The conductor presents the machine to the passenger, who puts in his fare in cash or a ticket, whereupon the conductor presses the spring which works the register and sounds an alarm-bell. The receptacle is perforated so that the contents can be seen, and is opened by a key of peculiar construction, kept at the office of the road. The whole affair is of polished steel, and is carried in the coat-pocket of the conductor, or attached to a shoulder-strap.

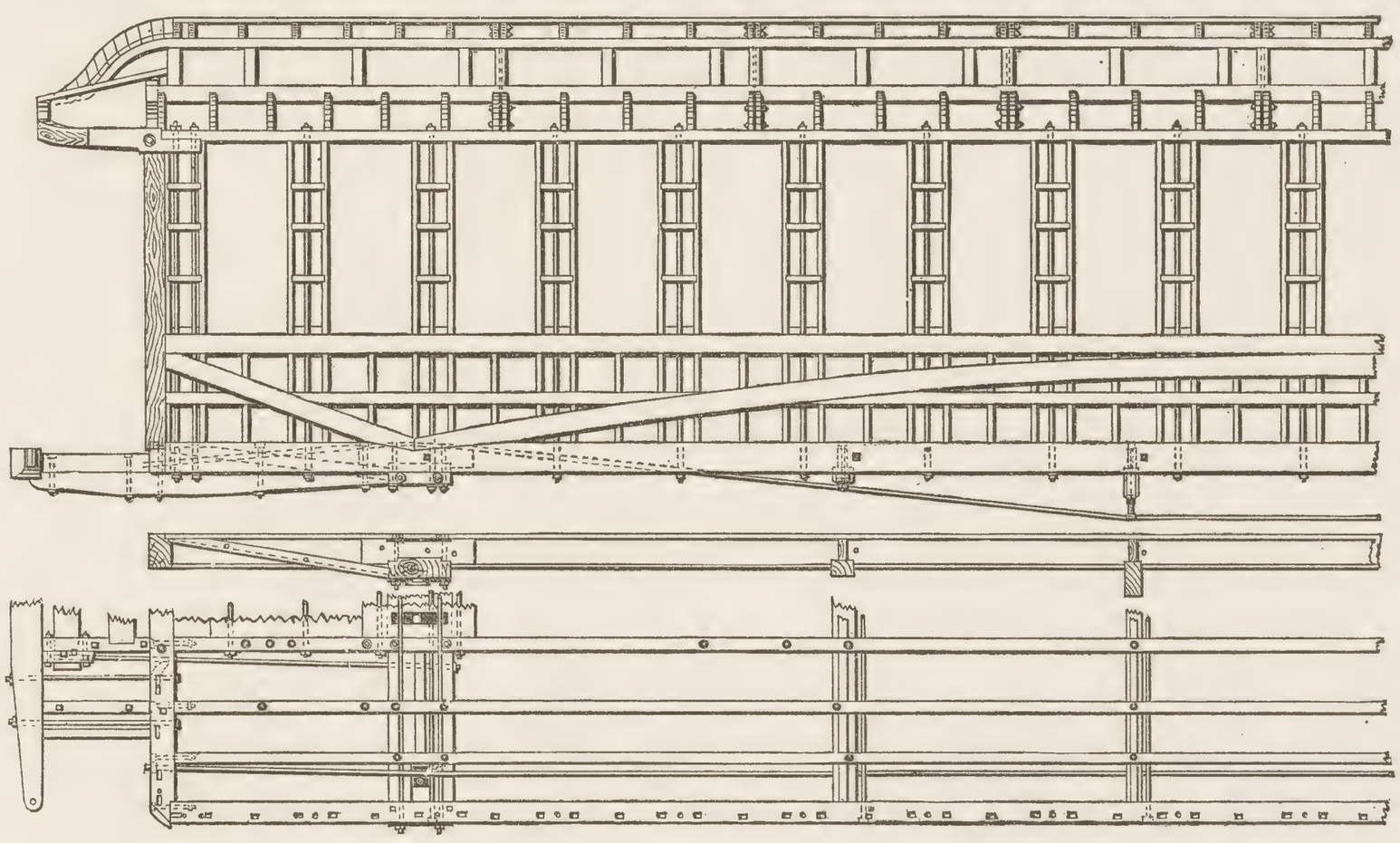
THE Chicago, Rock Island, and Pacific Railroad Company are building at Rock Island the largest round-house in the West. Its form is a perfect circle, with an outside radius of 997 feet. It will contain 42 stalls. The building will be fire-proof throughout, the roof being composed of wrought-iron trusses covered with slate.

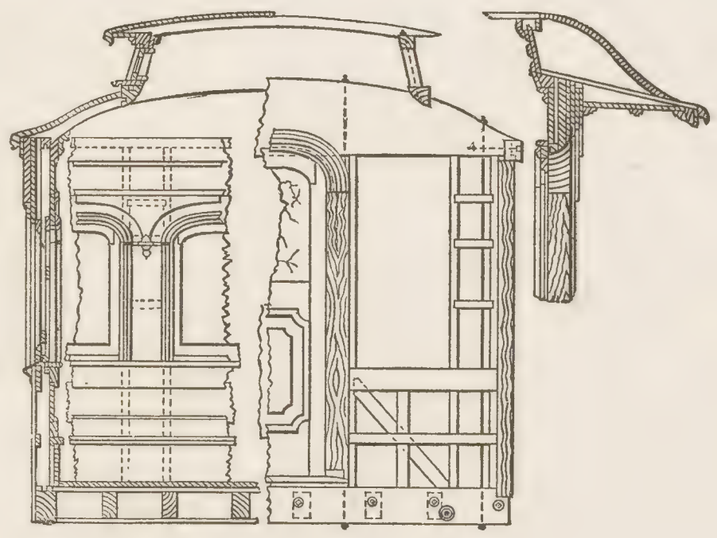
TEN large locomotives have just been shipped to Russia by the Grant Locomotive Works of Paterson, N. J. They are the first deliveries on an order for 65 of the same description for a Russian railway, and are said to be splendid specimens of American mechanism.

Improved Car-Framing.

THE drawings represent a style of framing for passenger-coaches, the design of which is to diminish the weight without impairing the strength of the frame. This being a problem of considerable difficulty, its solution can only be reached by a gradual process of experiment and careful observation, with the view of determining just how and where superfluous timber can be safely dispensed with, without interfering materially with the general construction and design as approved by experienced car-builders. The cuts represent a side elevation and cross-section of the car-body, and a plan and section of the floor-frame.

The floor being the foundation and chief point of resistance, its strength must not be in any way lessened, but rather increased, even at the expense of additional weight. In the design, however, which we illustrate, it has been thought possible to increase the stiffness somewhat, and at the same time reduce the weight and quantity of timber. At the shops where this method is being applied, the ends of the center-sills have heretofore been strengthened by





bolting to them pieces of oak of about the same size as the sills, these pieces running back some 10 or 12 feet from the end-sills, the object being to keep the ends of the car from sagging. As shown in the cut, these long and heavy pieces are replaced by a diagonal timber, 3½ by 10 inches, and 5 feet 3 inches long, extending upward from the bolsters to the end-sill, and weighing about half as much as the others. A block set in between the center-sills and notched over the bolster holds every thing fast. Truss-rods, both cross and lengthwise, rest on saddles over the bolster, the latter extending to the front and lower edge of end-sills.

Another prominent feature of the design is shown in the side-elevation, and consists of a piece of timber reaching from one bolster to the other, in the form of an arch, and in the place of the ordinary truss-plank. This plan, as applied both to drawing-room and day coaches, has shown very satisfactory results as regards a saving of material and reduction of weight. It is held that a single heavy plank placed upon its edge, although very stiff, does present all the resistance of which the same amount of material is capable when in the form of a truss; or, in other words, a truss with the end braces, as shown, is stronger than the same quantity of timber in one piece and of the same length; consequently, instead of a Southern pine plank 2 inches by 12, an ash plank 1 inch by 5 is employed; and to get from it the greatest possible resistance, it is sprung into an arch, the grain running straight from end to end, the center rising to the belt under the window-sills, and the ends resting upon the bolsters. It is let into the posts and studs by notches, this part of the work requiring special care to secure perfect joints, without which the stiffness would be destroyed. A diagonal brace extends from the bolster to the corner-posts, and aids in keeping the car up. Although the car is not finished with a belt-rail, a broad belt 1 inch by 5 is let into the posts just under the windows; this, with the usual belt below, gives great stiffness to the car-wall. The posts are 1¾ by 3½. There are no braces between the windows, the car being kept up by the truss-arch, the belts, and the main truss-rods. In this way, much weight is saved, and it is claimed that there is no loss of strength and durability. The way in which the cars stand up to their work seems to justify the claim; but time will determine this point, upon which opinions differ so widely.

The height from side-sills to plates is 6 feet 8 inches. The plates are 2¾ inches square. They are fastened with ⅝ tie-rods with enlarged ends, one rod between each pair of posts. The letter-board is of whitewood in 20-foot pieces, dressed down to 12 inches scant in width, these lengths requiring but few joints, and making a better finish than shorter ones. The windows are good size, the glass being 18 by 27¾ in the clear. The distance from outside to outside of posts is 11 inches, the openings for windows 22 inches. The roof and hood are of the ordinary construction. The corner of hood-moulding is a hollow casting. The window-sills are cast; the furring along the bottom of the ribs deserves special notice, as the weight saved here is considerable. Where the rib joins the plate, a large block is usually put in to get a surface flush with the inside of the rib. Instead of using this block between each pair of ribs, a ½-inch strip of suitable width is halved into the ribs so as to come flush with the inside of them. This leaves a fair, smooth surface for the finish, saves from 50 to 100 pounds weight in the roof, is considerably stronger and cheaper, and makes a better job.

SOME of the double-deck cars, which are quite common upon French roads, exhibit a most extraordinarily small proportion of dead weight. One on exhibition at Vienna, with a capacity of 90 persons, weighed only 11·75 tons. Freight-cars weighing but 10,000 pounds carry 20,000, or even as much as 30,000 pounds.

THE smallest circular saws in use are those employed in the manufacture of gold pens, and are only half an inch in diameter.

A Glance at Train-Brakes.

BY J. M. BLANCHARD.

THE importance of what is technically termed a "train-brake," or a brake applied to all the cars of a train, and so arranged as to be operated by the engineer at his pleasure or as circumstances may require, is well understood and generally acknowledged; and hence a glance at what has been done toward perfecting such devices will, it is believed, be of interest to railroad men, if not to the whole community. The impression entertained by many that brakes of this description are a modern invention is an erroneous one. The idea originated many years ago, but is none the less important on that account. The first patent for such a device that I have been able to discover, was granted to James Nasmyth, of Patricroft, near Manchester, England, in 1839, and was designed to act upon all the cars of a train, and to utilize the momentum of the train in checking or arresting its movement. The inventor describes it as "the adaptation of certain mechanism to railway-carriages whereby the train is made to stop, or is assisted in stopping, by means and through the agency of its own velocity. So perfectly is this accomplished, that in exact proportion to the velocity and weight of the moving train, is the amount of stopping agency; and so entirely is this placed under the control of the engine-man or his assistant, that he is able at all times to convert the momentum of the train into the agent whereby such momentum is absorbed or destroyed, thus bringing the whole train from a high velocity to a perfect rest with a much greater rapidity of transition than has heretofore been done." From this, it would seem that the credit of being the first patentee of a train-brake is due to Mr. Nasmyth. In 1840, another brake designed for the same purpose was patented to Henry Montague Grove, of Bolney, Buckingham county, England, the power being derived from electro-magnets or magnetism generally. The inventor describes the device as "consisting in the application of the power of an electro-magnet, or magnets, or of magnetism generally, whether applied directly or indirectly to the wheels of a train or other vehicles."

These two patents must be regarded as having laid the foundation for what has since been done, by directing the attention of railroad men to the subject; and hence, whatever may be said as to the particular manner in which these inventors proposed to carry out their improvements, they are to be regarded as the pioneers in the work. Since the issue of the last-named patent, some of the best minds in Europe and America have been endeavoring to render these improvements more practical. A patent for a train-brake was granted in England to Henry Bessemer, in 1841, another to S. C. Lister, in 1848, and another to F. J. Reaux, in 1853, the latter using air, steam, and water as the motive force. From these beginnings, more than seventy devices, nearly all of which were for train-brakes, have been patented and rejected. These failures, instead of discouraging further effort, have stimulated the energies of such men as George Westinghouse, J. Y. Smith, William Loughridge, Gardner & Ranson, and others, in the same field of discovery. The essential points are as to the best agent to be employed in the working of brakes, and the best method of applying the same. In regard to the former, there is no question that the use of air in a compressed state, or acting by its normal pressure upon a vacuum, is most in favor with railroad men. There are those, however, who strenuously advocate the use of steam on account of its superior pressure and certainty of supply; and others, like Mr. Grove, who insist that magnetism is the best agent. Special reasons are urged in favor of each, and doubtless in some respects each is superior to the others; but this can not be regarded as settling the question of general superiority, because this must always depend upon readiness of application, certainty of operation under all circumstances, durability, and freedom from liability to derangement.

Some of the most apparent advantages and disadvantages which attend the use of each of these different agents may be briefly enumerated as follows: First, the use of steam in cylinders to be placed upon the different cars of the train, has the advantage of certainty of supply, it being taken from the generator of the engine, in which it is maintained at such a pressure as to make its use in comparatively small cylinders possible; and further, it does away with the necessity of providing an extra engine for driving an air-pump or a pump for compressing the air, as well as with a reservoir for containing such air. The disadvantages attending its use are, that in winter, and especially in cold climates, the pipes through which it is conveyed are liable to become filled with water of condensation and eventually with ice, which of course renders the whole apparatus inoperative for the time being. Another objection is that the cylinders are liable to be partially filled with ice, and their pistons rendered immovable; or if moved, they are liable to break the cylinder-heads. The advantages which attend the use of compressed air in the respects above alluded to, are that the danger from clogging or destroying the pipes and cylinders is obviated, as there can be no freezing, and that in extreme cold weather there is no loss of time in its action consequent upon condensation in the pipes after it is admitted, as there must necessarily be in the use of steam. That this system has its disadvantages will not, it is presumed, be denied; they are, that it requires an engine and a pump for compressing the air, and a reservoir for containing it; which devices are somewhat expensive in first cost, and require careful watching and manipulation while in use, for the reason that if any one of them fails, the whole apparatus is rendered inoperative, and the engineer is left without the means of controlling the train except as he is aided by the brakemen. Another difficulty which has been found to exist in the use of this kind of motor, is in keeping the joints tight and preventing the loss of air from the pipes and around the pistons.

The advantages which may be regarded as due to the use of external atmospheric pressure are, that there is a far less loss of power from the friction of the parts, less cost of machinery, less liability of derangement, almost entire freedom from cost of repairs, and less liability to leakage in the pipes, as the pressure tends to keep them tight instead of opening them, as in the case of steam or compressed air. On the other hand, this system involves the use of larger cylinders, as in no case can the force exerted be greater than the pressure of the atmosphere upon a vacuum. The merits and demerits of the magnetic system will not be discussed here, as it has not been recently tested to such an extent as to develop its value, or rather to justify a comparison of it with those better known.

Assuming that the above is a fair statement of the merits of the different motors at present in use, the remaining question to be asked and answered is, do either of the systems presented afford the best means that can be devised for operating car-brakes? If so, then let all our railroad companies at once adopt it, and thus afford the greatest possible amount of security to their patrons. If not, then let the inventors of the country set themselves to work to produce something better. Should any inventor be induced to turn his attention to this subject by what has here been said, or from any other cause, he will, I trust, permit me to make a few suggestions, which are, that the principal things to be borne in mind are simplicity in the mechanism and certainty in its action. It is undoubtedly true that whatever valid objections there are to existing devices, arise from their complex character, which renders them liable to fail just at the time when they are depended upon to prevent the loss of property, if not of life. It is important that the cost of brakes of this character should be as small as is compatible with efficiency, but it is not probable that a really reliable brake apparatus will be condemned because it costs a hundred dollars more than an inefficient one. If the real want of the times is properly apprehended, it is a train-brake which shall comprise in itself the qualities above described, irrespective to a great extent of its first cost, because the persons whose business it is to purchase and use them, fully understand that it is true economy to pay any stipulated sum as first cost, rather than a less sum which will eventuate in the expenditure of the difference, and perhaps a great deal more, within the first six months in the way of repairs. That it is possible to produce a brake more efficient and economical than any of those now in use, can hardly admit of a doubt.

A Smoke-Consuming Device.

THE St. Louis *Republican* gives an extended and interesting description of a new invention just perfected by an old resident of that city, for obviating the disadvantages arising from the smoke of steam-engines, whether steamboat, railroad, or stationary. The model is described as representing the boilers, etc., of a steam engine, but instead of the smoke ascending upward, out of chimneys, as in the ordinary way, it is conveyed by an ingenious mechanical device, underneath, and consumed or expelled at any point where it will be the least objectionable. During some recent experiments, a quantity of brown paper, representing a fuel affording abundance of smoke, was in the furnace, and by the turning of a hand-crank a draft was caused which set the paper ablaze, and drew the smoke through the upright tin tank, representing the flues of a boiler, where it entered a tube which passed over the boiler, and descended on the opposite side underneath, where, by the suction caused by a mechanical contrivance, the smoke was expelled, after having made the circuit of the machine. If smoke can be conveyed or drawn to any place desired, under the control of a simple mechanical device, it will be seen at once what an advantage will be possessed in propelling our steamers. The invention will do away with high chimneys, or any visible chimneys at all; and thus the important problem in regard to encountering bridge obstruction, inasmuch as, without the stately chimney, our largest steamboats could pass under the arches of bridges as easily as barges or canal-boats. There would be no need of smoke stacks above the boiler-deck of any steamer. The engineers have entire control over the draft, and would consequently be able to control the generating of steam. By this process all the smoke may, it is claimed, be carried over the fire and consumed, and a saving of fuel effected of from twenty-five to thirty per cent. Should further experiment on a larger scale attest the practicability of the contrivance, as claimed, it will prove one of the most valuable inventions of the age.

Railroad Complications in the North-West.

IT is evident that the culmination of the war made by the "Granger" influence in several of the North-Western States is about being reached, and the indications are that it will be injurious to all interested. The officers of the various railroads principally affected are pursuing a temperate and wise course. As a rule, they are complying with the State regulations as far as they can, but they tell the public frankly that this compliance is disastrous to their business, and must result in serious embarrassment to the companies. The rates authorized by the laws in question will not cover the expense of running first-class trains on some roads, and therefore such trains must be discontinued. The accommodations, in short, must be made to accord with the rates, and in doing this the public suffers more than the railway companies.

The State authorities, generally, are less temperate than the railroad managers, and exult over their successes with as much enthusiasm as the French mob displayed at the destruction of the Vendome column. No one questions their right to so exult, but the wisdom of such a course may well be doubted. In spite of all these enthusiasts may say, the sensible people of the United States can not be convinced that rail-

roads have, in any sense, been an evil or an injury to the West. No unreasoning frenzy can prove that the farmers on the prairies have been made poorer by the steam transportation which has connected them with the centres of trade; and, therefore, the efforts made, under cover of law, to destroy the value of railway investments, and hamper the business of transporting, are unwise and unjust. If the laws stand, the railways will go backward, until such facilities only are presented as the arbitrary rates will render remunerative. If they do not stand, then the time, the money, and the temper wasted in the strife will all have been in vain.

The worst feature of this contest is the unfortunate position in which it puts our credit. Railroads in the West were not constructed and equipped by local capital. On the contrary, the money to build them was furnished in the East and from abroad. Under the laws now being enforced, the belief is general that the roads can not meet their interest obligations, and that many of them must default. Such being the case, capitalists are becoming alarmed, and it is fair to presume they will try to save themselves if they can. Forced sales of roads will, in consequence, undoubtedly be made, and such sales rarely, if ever, profit the stockholders. County, municipal, and individual stockholders in the West may, therefore, find the effects of these laws operating disastrously at home. In addition, no money can be raised, while this state of affairs continues, on the bonds of Western roads, and because of this, improvements and extensions must be stopped. Rails, rolling-stock, and bridges wear out, and if not repaired or replaced, complete ruin soon follows. It is useless to follow out this idea, as it will amplify itself to every sensible man; and it is plain to be seen that, sooner or later, this fight on the railroads, if successful, must react upon the communities who are waging it.—*Official Guide.*

THE Kimball Manufacturing Company, of San Francisco, are building the rolling-stock for the Saucelito narrow-gauge railroad. The business of the company has increased to such proportions as to necessitate the leasing of the property on Fourth street opposite their works, with a frontage of 130 feet. Their weekly pay-roll involves a disbursement of about $10,000. The new buildings will be occupied by the carriage department.

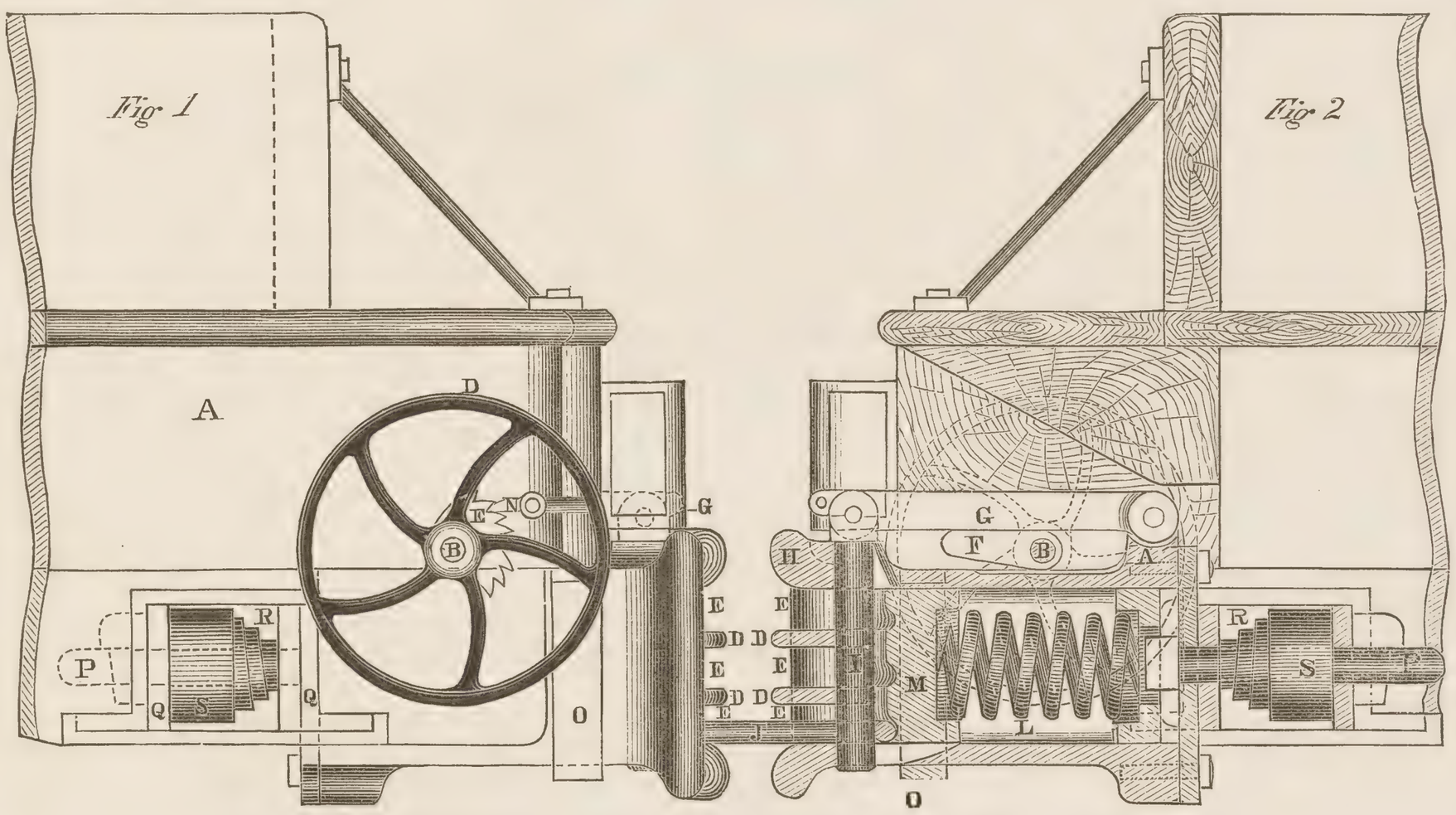
IT is alleged, with respect to a railroad in Arkansas, that in order to realize the State aid, the company built a section of ten miles, drew the bonds thereon, took up the rails and relaid them on the next section, and drew another installment of bonds, and so on, till its whole quota of bonds had been drawn, and no road built—the venal State authorities conniving at and probably participating in the fraud.

THE financial difficulties that lately beset the Allegheny Valley Railroad Company may now be considered as removed, and a successful future seems to be well assured. The road is an important one, and will become more so year by year.

Boyden's Patent Safety Car-Coupler.

THE demand is everyday becoming more imperative, both on the part of railway managers and the general public, for some method by which cars can be coupled easily, quickly, and surely, without danger to life or limb. To accomplish this, the necessity of going between the cars must not only be entirely obviated, but the means by which the coupling is effected must be so perfect and unfailing as to make an employee liable to instant discharge from service who shall expose himself to the risk of being crushed. Nothing short of this will put an end to this class of accidents, the horrors of which have of late become so familiar and sickening. Whether the device which we illustrate fully comes up to what is required, our readers must of course form their own opinion by an actual inspection of its construction and operation. So far as we can judge from an examination of a very complete and elaborate model, embracing two cars with trucks and couplers, and moving on straight and curved tracks, we should say that it accomplishes all that its name implies, and is in every essential respect a safety-coupler, as well as sure and reliable in its practical working.

Fig. 1 represents a side-elevation of a car-platform with coupler attached, and Fig. 2 a longitudinal section of the same. The platform A has connected with it, and supported by proper bearings, a rocking-shaft B, with lever or wheel D and ratchet E at each end; also a cam or lifting arm F attached to the middle of the shaft. G is a lever pivoted at its rear end to lugs A (Fig. 2), and projecting upward from the draw-head H. At the forward end of this lever is pivoted the coupling-pin I, which is kept in a vertical position by the follower-plate M, and the spiral spring L behind the plate. The pin, however, has room to swing backward when the link strikes it in coupling, allowing the link to pass under its lower end, when the pin resumes its vertical position, and the cars are then coupled.



BOYDEN'S PATENT SAFETY CAR-COUPLER.

The uncoupling is effected by standing at the side of the car and turning the lever or wheel backward, which lifts the pin and releases the link J, and if desired, engages the pawl N with the ratchet and holds the link in its elevated position. The forward end of the draw-bar has separate spaces E E E for the entrance of the link in cases where the heights of draw-bars are not uniform. O is a yoke in which the draw-bar slides, P is a rod connecting rear and front ends, Q is a stationary plate, and S a volute buffer spring. These couplers are manufactured by The American Railway Improvement Company, Harrisburg, Pa., and will be furnished for trial free of expense. Address William A. Boyden, superintendent, Harrisburg, Pa.

Hannibal, Missouri.

THIS city, which now contains about 15,000 inhabitants, has taken a fresh start since the completion of the Missouri, Kansas, and Texas Railroad, of which it is the eastern terminus. It is situated on the west bank of the Mississippi river, and has picturesque and attractive surroundings, including beautiful bluffs and ravines, and one of the finest bridges in the West. The future business likely to be developed by this new and extensive line of road, causes the extension of other lines to this point, and a corresponding activity in the various branches of business incident to the opening up of a vast agricultural region hitherto comparatively inaccessible. Immense stock-yards have been erected for the millions of cattle coming from Texas, and a new stimulus has been imparted to the lumber interest which centres here.

Here are also located the Hannibal Car-Works, with ample facilities for manufacturing cars of every class. The company is composed of the best business men of the place; and the quantity of dry lumber in their yard, and the improved machinery of every kind adapted to the business with which the works are fitted up, indicate that this establishment is designed to be second to none of its kind in the country. Situated on the Mississippi river, and at the terminus of six different lines of railroad, it is enabled to procure material and ship the manufactured cars to all parts of the country at less expense than other similar establishments, east or west. All business of this kind at present is dull, but these extraordinary facilities, and the reputation of their cars, enable the company to keep their works running to their full capacity whenever there is any demand. They manufacture every description of freight, ore, gravel, passenger, baggage and mail cars. H. C. Whiting, the president and general manager, has been long connected with the manufacturing departments of different railroad companies, and has taken the management of the affairs of this company with the determination that all work done under his direction shall equal in quality of material and workmanship that produced by any railroad companies at their own shops. All improvements which have proved of value in decreasing cost of repairs, are adopted and used in the construction of cars at these shops.—*Ex.*

ACTIVE operations are under way for the construction of a new bridge across Niagara river, in the interests of the Canada Southern road, whose managers complain that the single track of the present International bridge is not sufficient for their business, and that the slow transit through the city of Buffalo is also a serious drawback. The new bridge will cross the two branches of the river at Grand Island, and connect with the Erie and Central roads, near Tonawanda. The water at these points is only twenty feet deep, and the current only one and a half miles an hour, as against ten or twelve miles at Buffalo.

MR. JAMES C. CLARKE, for some time past the general manager of the Erie Railway, has resigned his position.

Railway-Axle Accidents.

THE records of broken axles on the twenty-three railways embraced in the United German Railway Administration show that the number of axles broken in 1872 was 185, of which 86 were broken in cold and 99 in the warm months. In previous years, the larger number of accidents occurred during cold weather, and the exception of 1872 seems to prove the rule that extreme cold favors accidents of this kind, for the winter was unusually mild. The average time in which the axles were in use before they broke was, for locomotives, ten years, two months, three days; for tenders, eleven years, one month, eight days, and for cars, eleven years, seven months, and twenty-three days. Of all the axles broken, over 35 per cent were running at full speed, 40 per cent at a moderate speed, and the breakage was first noticed in 23 per cent of the cases when the cars were standing still. The latter breakages were, for the most part, caused by overheating. In 128 cases, no damage was done; in 6 cases, the car merely run off the track; in 35 cases, the car was injured; in 15 cases, the road was injured, and in 1 case a life was lost. There were fresh fractures in 33 of the axles; 45 axles were cracked or imperfect less than one third of the cross-section; 106 were imperfect more than one third of the section. The causes of breakage were as follows: 118 from ordinary use, 27 from poor material, 27 from hot boxes, 9 from bad construction, 7 from bad welding, 1 from overloading, 1 from running off the track, and 1 from collision. Of the 118 broken in ordinary use, all had old fractures, and in 87 of these the fractures were in places easily seen. For several years, the average life of car-axles has been clearly determined, and it seems possible that by vigilance and care at least 90 per cent of the accidents from breakage of car-axles might and should be avoided.

Hard Woods.

THE steady advance in the price of hard-wood lumber for some years may be taken as pretty good evidence that the available supply is decreasing at a rapid rate, or that the demand is increasing faster than facilities are furnished to put it in the market. There is no room to question the first proposition, however; for let any one travel in almost every direction in the north-western States, where, twenty years ago, were fine forests of hard-wood timber, and he will no longer doubt the fact that a very large proportion of such forests have been depleted of this wooded wealth.

The axe of the pioneer has been called "a great civilizer," but it has, at the same time, been a despoiler of untold riches in the hands of injudicious or thoughtless men. It is true that hundreds of men have hewn down the primeval wilderness and carved out homes in the deep forests; but in almost every case, they have done so with scarcely a thought or a care about the value of the timber which fell before their axe-strokes. They selected sites for their dwellings and "clearings" upon considerations into which the relative or prospective value of different kinds of wood did not enter. Their "slashings" took no account of varieties or kinds of wood, and walnut, cherry, bird's-eye maple, etc., were sacrificed indiscriminately with beech, elm, or poplar. A tree, no matter of what kind, was an enemy to be got rid of; and thus hundreds of thousands, yes, millions of feet of the choicest hard-wood varieties of timber were destroyed in the conflagrations of the "wind-row." Many of the men, who acted so unwisely, lived long enough to see and regret this improvident waste of what would have proved a very important source of profit to them. The "clearings" might, very often, have been located where the sacrifices would have been less, and the ultimate benefits infinitely greater.

Now, this may recall the story of the milk-maid, or its moral, but it may not be altogether profitless; for the same thing is still going on in some of the newer portions of the wooded regions of the North-West; and if those who are pursuing a policy so suicidal do not desire to repine over short-sighted and improvident destruction of valuable resources, let them take warning and preserve their hard-wood timber.

This wanton destruction of woods which possess so much intrinsic value, has had very much to do with the appreciation in prices referred to, and as these woods become scarcer, the prices will advance still more. The consumption in the legitimate wants of trade is increasing also every year, and while the demand will draw more largely upon the resources of the forest, and these will be annually shortened, it is a question—and a very important one—how long they will last? Certainly not always; and while we shall not attempt to answer the question at this time, if we had the data upon which to make an estimate, we may suggest that it is a matter upon which not only those of to-day, who have a personal interest so far as business is concerned, may profitably bestow some attention, but one also upon which every thoughtful man who looks to the future will do well to ponder.—*Wisconsin Lumberman.*

The Position of General Superintendent.

THE position of general superintendent of a railroad is one of dignity, trust, and great responsibility. He is responsible to the president and directors for the successful operation of the entire line. He should be, and in most cases is, a man of exceptional business tact and experience. In the management of his subordinates he is practically a despot, his decision on any thing affecting their interests being final. He has to consult with and approve the policy of the general officer of the road, and, in the course of a day's work, matters the gravest and most trifling crowd on his consideration. The roadmaster writes that his iron is deteriorating, and demands a supply of rails. An indignant passenger claims immediate audience in order to report an incivility. The master of transportation telegraphs that a party of Grangers have boarded a train at Saint Slowgo, and insist on paying three cents a mile, the company's tariff to the contrary notwithstanding. The president informs him that he desires his presence 500 miles away on urgent business. A stock man rushes into his room, redolent of manure, and indignantly declares that he will never ship another hoof over his road unless such and such a man be instantly discharged.

Worried and anxious, he calls his chief clerk, hands him a bundle of letters for classification and reference, and rushes to the street to keep an important appointment. Here he is waylaid by men with every conceivable description of axe to grind. "How are you, Major?" "How-de-do, Colonel?" "Have you seen my new head-light?" "How about that coupling, the merits of which you promised to consider?" "Halloo, General, what sort of a fellow have you got in your office?" "Why, my dear sir, what is the matter?" "Matter? Thunder! I sent over just now for passes for my wife and daughter over your line, and he coolly referred me to you." He is watched at his meals, waylaid at his house, and is subjected to an amount of promiscuous importunity sufficient to affect his mental balance.

A general superintendent has to watch and protect the interests of his road, a duty which involves a great deal of correspondence with men in co-ordinate positions, as well as a great deal of traveling for the purpose of consultation. One thing is ever present to his mind, and that is the auditor's monthly exhibit—increase of traffic and decrease of expenditure are the ends toward which all his energies are directed, and in proportion as he succeeds or fails, so does his reputation as a successful administrator wax or wane. To do this thoroughly, a personal acquaintance with what is going on over the road is necessary. A good superintendent is a great deal on his road. It is rare, indeed, that any thing escapes his observation, and woe betide the unlucky wight whom he catches deficient in any of the essentials of duty. Under circumstances the most trying, he is supposed to be suave in manner, and to succeed should have mastered the secret of Tamerlane, to rule with an iron hand in a velvet glove. In view of the multifarious duties and responsibilities attaching to the position, it is only fair that the public should extend to him a large measure of consideration. One person complains that a lengthy statement of grievance, real or suppositious, has not received attention at the hands of the officer to whom it was addressed, whereas the letter had been referred to the head of the department to which it properly belonged, and in all probability a month might elapse before an answer was possible. Another complains of the curtness of a reply, construing necessary brevity into intentional incivility, when, in fact, the answer covered the whole matter in question. Even men of business at times forget the rules which they enforce in their own establishments, and expect an officer vastly more burdened with care than they to surpass them in diffuseness and prolixity of style. Generally speaking, the subordinates in a general superintendent's department are gentlemen of culture and experience, and if the general public would strive to absorb the idea and cease to treat them and their chief as so many badgers to be baited, an effectual start would be made toward the attainment of reciprocity of sentiment, without which business men can not agree to differ in the settlement of matters in dispute.—*Exchange.*

Railroad Hotels.

THE Baltimore and Ohio Railroad Company have established several capacious and well-managed hotels along the line of their road, for the convenience of the traveling public. One of these is the Viaduct Hotel, at Washington Junction, in Baltimore, which is greatly admired for its graceful proportions, and is an ornament to the vicinity. It is a station and hotel combined, built in the Gothic style, of Patapsco granite, with red Seneca stone trimmings. It consists of a main building, 55 by 70 feet, three stories high, and a station building 43 by 52 feet, two stories high, the second story being constructed with the hotel. The whole is covered with a slate roof of variegated colors and patterns, and finished with iron cresting and finials. The waiting-room is 23 by 40 feet, and the dining-room 25 by 50. The building is heated by steam and lighted by gas manufactured on the site. The grounds about the hotel are laid out and ornamented with trees, shrubbery, and flowers. The provision for the accommodation of guests is ample in every respect.

The Queen City Hotel, at Cumberland, is a large and magnificent structure. It is built of brick. The centre building, 140 feet high, is two stories in height, surmounted by a lofty cupola, from which a magnificent view is had of the city and surrounding mountains. The wings, 48 by 84 feet each, are four stories in height, and the back building, containing the kitchen apartments, 38 by 97 feet, is three stories in height, the whole being covered by a handsome slate roof. An ornamental iron piazza, 10½ feet wide, extends along the front and ends on the first floor, whilst there is a two-story portico between the wings in the rear. A lofty, well-lighted basement extends under the whole building, in which are the billiard-room, restaurant, laundry, etc. The dining-room is 34 by 140 feet, and will seat 400 persons. The building is heated throughout by steam, and is luxuriously furnished. The rooms are beautifully frescoed, and in all its fittings and appointments the hotel is first-class.

The hotel at Deer Park, on the summit of the Alleghanies, comprises a centre building 56 by 48 feet; two wings, each 55 by 40 feet; a rear ordinary-room building, 36 by 50 feet, and kitchen and servants' extension, 30 by 63 feet. The building is frame. The main or centre building is four stories above the basement, and the wings, dining-room, and kitchen building three stories above the basement. The main or hotel building is covered with a Mansard roof. There are 104 sleeping-rooms in the hotel, besides spa-

cious dining, sitting, and reading-rooms, parlors, etc. A handsome veranda extends along the front, and the building, in point of convenience of arrangement and beauty of design, is not surpassed by any of the summer hotels of the country.

All these hotels are kept evenly to a high standard of excellence, and have already had a great influence in determining passengers to this road. Other buildings will be erected at other points upon the road as the comfort of passengers may require.

How to Varnish.

VARNISH should always be applied in a warm room —as warm as a person can work in comfortably. At a lower temperature, there is always moisture in the air—an invisible dew, which gives the varnish a milky and cloudy appearance. This will happen even on a fine summer day, and the only preventive is to employ artificial heat, to produce a temperature of at least 75° Fahr. At this temperature, the moisture is not precipitated until the alcohol of the varnish has sufficiently evaporated to leave a thin and smooth film of shellac. The gloss and durability are entirely dependent upon this. The article to be varnished should be brought into the workshop a few hours before the work begins, so that it may get warm. The surface is smoothed, washed, and rubbed dry with chamois leather or a piece of silk, and every trace of dust, moisture, and dirt removed with a clean soft brush, but no oil or grease must be used. The varnish is now lifted lightly with a flat brush, not immersed too deeply in it, and a thin coating applied. It is well to begin in the centre or at the highest part, and approach the edges with long, straight, rapid, and even strokes, and a gentle pressure. Care must be taken at the corners and edges. The film of varnish should be about as thick as a sheet of paper. When finished, it should be exposed to the sun's rays or artificial heat, and carefully protected against draft and dust. Cold air or a draft over the article gives the varnish a dull look. When this happens, the only remedy is to apply a second coating, and hold it near the fire, so as to dissolve the previous coat, but not so near as to blister it.

IT is the determination of the railroads in Iowa and Illinois to change their schedules of prices so as to conform to the new railroad laws, pending a final decision of their validity by the Supreme Court. The Chicago, Rock Island and Pacific, the North-western, the Chicago, Burlington and Quincy, and other lines, have already adopted this policy. There is to be a general compliance with the law whenever it can possibly be done, and as the president of one of these roads recently said, "the people are to have no chance to complain of injustice."

THE American Fork Railroad (narrow gauge), near Salt Lake City, is sixteen miles long, and has a continuous grade of from 50 to 300 feet to the mile, and curve of 250 feet radius. One of their locomotives, built by Porter, Bell & Co., Pittsburg, Pa., having cylinders 12 x 16 and six drivers, weighing 17 tons, takes a train of over 47 tons up these unusually steep grades, making the trip in one hour and twenty-eight minutes. The road is an entire success.

WORK was resumed on the Flint and Père Marquette Railroad, west of Reed City, Mich., on the 28th of July. The company expect to complete the entire line to Ludington in six weeks, forming a great through route from the lake ports to the Eastern cities.

Improved Grain-Car Door.

THE engraving represents an improvement in grain-car doors, invented and patented by Mr. D. F. Van Liew, of Aurora, Ill. The design of the invention is to provide a more effectual and economical method of opening and closing the side or end entrances to cars, by such a construction of the door and cattle-bar as that they will occupy no available space, or no more than their own thickness, and be easily carried to or from the side or end openings, whether the car is loaded or otherwise; also requiring less vertical space than would be necessary if the door turned edgewise on a central pivot, and consequently better adapted to low-roofed cars.

In the drawing, Fig. 1 represents an interior view of a freight-car, with the doors closed and the cattle-bars in position when not in use, near the roof. Fig. 2 is a cross-section of car-side, door and cattle-bar, showing method of fastening. Fig. 3 shows form of metal shoe into which the front end of door fits. A indicates the car-side and floor, B the usual openings, C the doors, D the metal bars pivoted to centre and end of door, and also to car-side near the floor, E a metal shoe which keeps end of door in position, F a metal bar holding the rear end in position when closed, H a lug which embraces the rear end of door when open and keeps it in lateral position, H^1 blocks upon which the door rests, keeping it clear of obstruction from filth, frozen water, etc., C^1 cattle-bar held in place by guide-bars I and K, and M a hook for locking cattle-bar alone when closed.

FIG. 1.

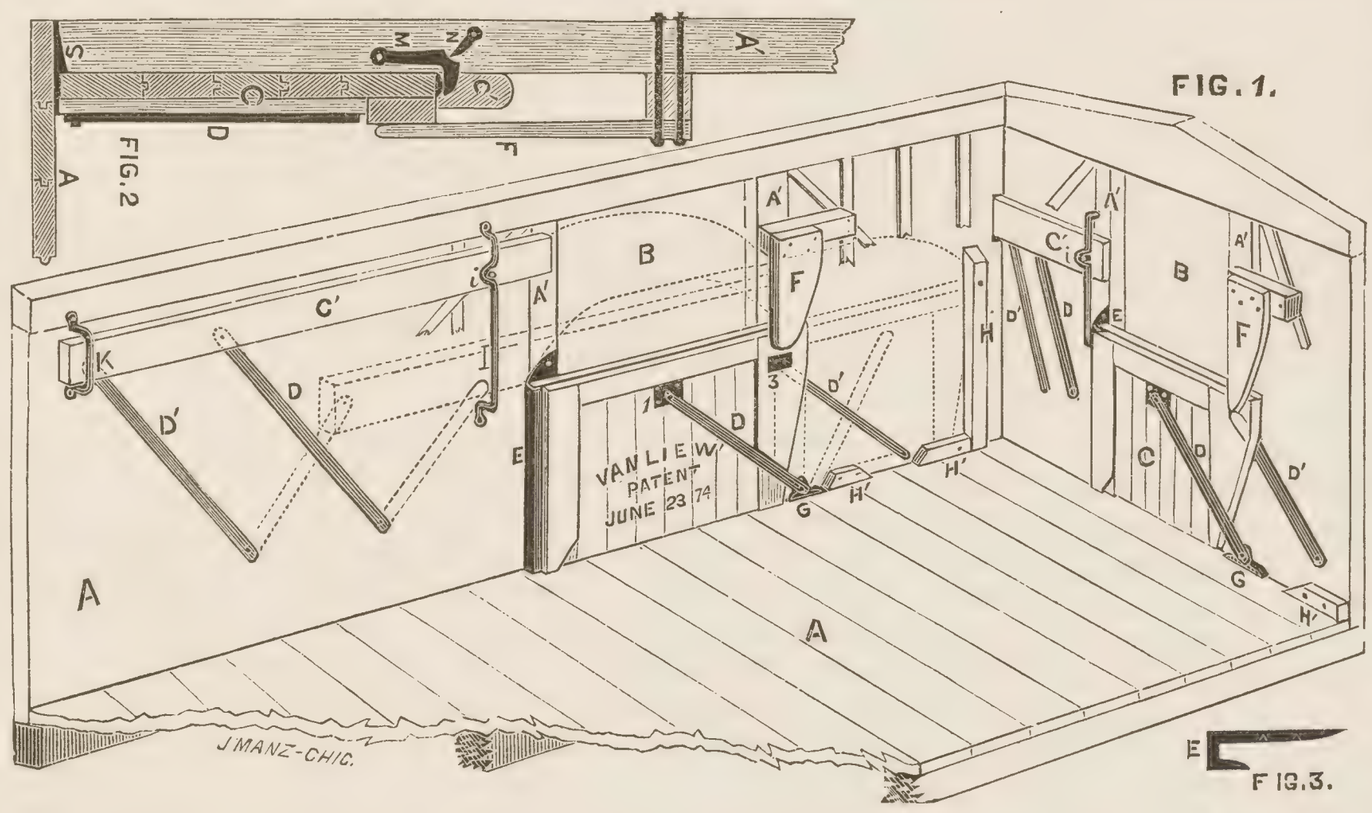


FIG. 2.

FIG. 3.

The movement and operation of the door and cattle-bar are indicated by the dotted lines. The two can be locked together, and can be also used without the usual housing or casing provided for them when open. The only objectionable feature is the guide-bar F projecting inside beyond the thickness of the door; but the inventor informs us that he has remedied this by a substitute costing no more and occupying no more space. The door is applicable to any size of opening. Cars can be equipped with door alone or with supplemental door if desired. The improvement has been adopted and approved by a number of Western roads. For farther information, the patentee may be addressed as above.

Consumption of Wood by Railroads.

AT the end of 1873, there were reported 71,564.9 miles of main lines, and 13,512 miles of sidings and double tracks, making 85,077.9 miles of railroads within the United States. Of the main lines, 5,462.3 miles were in the New-England States, 14,209 in the Middle States, 33,905.9 in the Western States, and 2,681.3 in the Pacific States. Upon these roads locomotives were running, and a large proportion of them used wood for their fuel. The number of ties used varies from 2200 to 2800 per mile. If we take 2500 as a mean, we find that 212,692,500 pieces of timber, eight feet long, and from six to eight inches between upper and lower surfaces, are required to supply this single item.

The durability of ties varies with the kind of timber, soil, climate, and use, ranging from four to ten years. Taking six as an average, the amount required for annual supply must be 35,448,750 pieces, or 94,530,000 cubic feet. In considering this, we must remember that a large amount of waste occurs from hewing and from leaving the upper parts of trees, some of which are used as firewood, the remainder being a total loss. It must also be borne in mind that the demand for timber by railroads, besides for ties and for fuel, is very great, including fencing, bridges, buildings and structures of various kinds; that the risk from fires is exceptionally great, and our requirements in this direction are increasing even more rapidly than our supplies are wasting.

AN engine on the New-Jersey Midland road has been fitted with a smoke-burning arrangement in the fire-box. On one of the early trips of the engine, as the fireman opened the furnace-door to throw in a shovelful of coal, the gas burst out with such volume and force as to throw him entirely off the engine. In falling, he struck on his head in a culvert and was killed. Another fireman was put on in the dead man's place, and in a short time he had his face terribly burned. One would suppose it would now be rather difficult to find a fireman for that engine.

A METHOD has been in successful operation for a year on the line of the Northern Company of France for informing the driver of a train whether the way is open or not. According to this arrangement, the signalman, when he turns a disc, sends an electric current in the direction of the coming train to a bar placed between the rails; when the engine reaches the spot, a metal brush, placed between the wheels, sweeps the cross-bar, the current passes to the engine, and, by means of an electro-magnet, presses upon a lever which opens the steam-whistle, thus making it virtually automatic.

HAND-SAWS in America and England have the teeth pointed from the handle, while in Asiatic countries and in Greece, they are made with teeth pointed the other way. The latter must be operated by pulling them; the former by pushing. In delicate work, and where very fine small saws are used, the Eastern saw is the best. The Orientals differ from us in setting the teeth of the saw also. They turn a group of a dozen one way, and the next group the other, while we alternate one on one side, the next on the other.

THE remaining sections of the Grand Trunk broad-gauge track, east of Montreal, it is understood, will be changed to the uniform standard on the 26th of September. This road will then be able to pass the cars of nearly all the American railways to any stations on its line. Extensive preparations are being made in advance, and no doubt the change will be effected as successfully as that between Montreal and Stratford last year.

THE Baltimore and Ohio Railroad Company is pushing the work on its Chicago division. Laborers are engaged on both ends of the line, and the new road will be in running order by the 1st of November. Its entire length is 268 miles, running midway between the Lake Shore and the Pittsburg, Fort Wayne and Chicago roads. The grades do not exceed 26 feet to the mile, the bridges are all iron, the rails 64 pounds to the yard, and 3000 ties are used per mile.

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the coöperation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Ornamentation.

As the country grows older and wealth accumulates, there is an increasing fondness for artistic embellishment among all classes of the community. It is exhibited in a great variety of ways, but most prominently in architectural decoration, in the patterns and style of furniture, and in the interior finish of offices, dwellings, churches, and public buildings. Leisure and opportunities for study, travel, and observation, have stimulated æsthetic cultivation, refining what is gross, perfecting what is crude, establishing better standards, imparting a more accurate knowledge of principles, and a capacity of discriminating between what is graceful, pleasing, and harmonious, and what is uncouth, discordant, and offensive in the diversities of form and color. We are not content with the bare comforts as distinguished from the luxuries of life. Things of utility are not valued altogether for the uses they subserve. We must have embellishment along with them. Something must be superadded to please the eye and gratify the taste. This is all right and commendable; the perceptions are refined and quickened by it, and the pleasures of existence greatly augmented. This tendency, however, has its limitations. If indulged in from mere love of display, without discretion, and subject to no restraint, the result will be otherwise than beneficial. Mere wayward fancies, fantastic freaks and whimsical absurdities, are not art. They may attract for the moment the vulgar gaze, but being destitute of any real meaning or true decorative power, they are sure in the end to be regarded with indifference and aversion. A great deal of what passes for artistic ornamentation in the architecture of the period, and in general decoration, is little more than ostentatious finery, mere mechanical toy-work, the novelties and vagaries of the fancy, and a violation of the laws of proportion, harmony, and adaptation—a chaos of details that might be arranged so as to be pleasing and effective, just as a lot of words in confused and meaningless juxtaposition might be so placed as to form an intelligible sentence or a graceful stanza. Where embellishment is combined with utility, one should naturally suggest the other and coalesce with it. A pediment is beautiful in its place as connected with and forming some part of a roof; a column is exceedingly graceful and appropriate provided it has a suitable foundation and supports something; a cornice is a delight to the eye if it is duly proportioned to the wall and made of the same material.

We had something to say, a good while ago, in regard to the excess and misapplication of ornament in the construction of passenger-cars. There seemed to be at that time a proneness on the part of many builders for showy finery with a view to effect, producing thereby a kind of work either positively bad or indifferently good, and likely in the long run to please and satisfy nobody. We think there is less of this tendency now. The general taste is improving. Gilded bait in the shape of flashy ornament is not so alluring to the mass of travelers, and builders are getting to have a truer insight into what is essentially artistic and valuable in decoration. The traveling public appreciate *comfort* above every thing else, and if luxury can be had along with it, they do not object. Wholesome ventilation at all times, a medium temperature, seats adapted to the contour of the body, round instead of sharp-angled corners upon which to rest head, shoulders, and elbows—these being secured, a judicious amount of ornament in addition thereto is not out of place, bearing in mind always that enough is as good as a feast, and that an excess of stunning upholstery and doll-baby trappings is not necessarily incompatible with downright misery.

With respect to the outside of cars, why should there be such an expenditure of varnish, gilding, and costly surface-work? Here, elegance of form means economy of material; and beauty of surface means protection against the weather. Utility is all that need be suggested. Passenger-coaches are not stationary things like the façade of a building or the stained windows, frescos, and altar-pieces of a cathedral, to be studied in intervals of leisure and quiet, away from the turmoil of life and business. Art, be it ever so royal, can never impress the beholder very greatly amid the clatter of railway depots and station-yards, or while it is moving along the track with the speed of the wind. It is false economy to adorn under such circumstances. Costly panel-work and elaborate pictorial designs are almost as much out of place on the outside of a car as finely-wrought sculpture would be on a pedestal a hundred feet from the ground; but of course, if the public crave such things, they must be provided as a matter of policy until the vicious taste is outgrown. These objections do not apply so much to inside decoration. The occupants of cars have more time to scrutinize details and appreciate what is worthy of appreciation. In the style of finishing, there is considerable latitude for variety and artistic arrangement and combination; but whatever style is adopted, there should be no cheap trickery, no painted imitation suggestive of the meagreness of poverty. Ornament of any kind is not really an essential thing, but if it is fallacious, it is hardly worth the having. Surfaces showing the natural grain of wood are always beautiful and appropriate. Black-walnut, like stove-pipe hats, has had a pretty good run and still bravely holds its own in cabinet-work. It is a trifle too sombre for general finish, and is somewhat suggestive of the undertaker's shop. In car-finishing, it is already giving place to woods of a more cheerful tone, such as chestnut, oak, ash, and maple, all of which are beautiful in combination or otherwise. The market also abounds in a great variety of veneers which can always be used to advantage. Head-linings, if skillfully painted and toned, present a pleasant surface to the eye. There is no deception about them, because they are always taken for what they are. They should not be too glaring with primitive color; the neutral tints harmonize most agreeably with ordinary inside finishing. Absolute pure color is not suited to general surfaces, and nature uses it sparingly by limiting it mainly to flowers and butterflies. Mirrors can not well be entirely excluded from drawing-room and sleeping-coaches, but in ordinary day-cars they are neither useful nor ornamental. Little machine-paintings of landscape or other scenes, stuck here and there, are an abomination equaled only by the illuminated trade hand-bills in the cabins of third-class ferry-boats. A plain surface of varnished wood is much to be preferred to such trumpery.

As we have already said, we think there is a tendency on the part of builders to tone down some of the more showy and conspicuous features of car ornamentation, while sacrificing no element of comfort or any thing that ministers to a cultivated taste in an artistic point of view. A considerable portion of railway travelers, however, still have, and perhaps always will have, a weakness for whatever smacks of palatial splendor. When they journey for pleasure or business, they want surroundings a little more stylish than they have at home; and as railways, like traders and shopkeepers, are compelled to court patronage, this weakness of their customers must be humored while it lasts; but like other things of the sort, it will gradually correct itself, or at least assume a less aggravated form.

Whistling and Bell-Ringing.

THE excessive use of the locomotive steam-whistle and bell in the vicinity of towns and in thickly populated districts, has become such a nuisance as to give rise to very serious complaint. This is especially the case in summer, during the night-time, and on lines where the freight traffic is heavy; and it is a question whether the annoyance can not be very much lessened without detriment either to the trains or the public. In the early days of railroading, when the number of people living along the tracks was comparatively small, and but few night trains were run, the whistle was naturally resorted to as the readiest and most effective signal, and although the music was not soothing to sensitive nerves, it was tolerated as a necessary evil. The population now, however, has everywhere become more dense—trains, tracks, and crossings are far more numerous, and engineers are instructed to make all the noise they can as the only means of preventing accidents. The bell is kept constantly ringing, and the ear-splitting blast of the whistle is so frequent and common as to diminish very much its value as a signal either of warning or danger, while whole communities are disturbed, and the sufferings of the sick aggravated by the general clang and uproar.

Now it seems to us that it is incumbent upon railroad managers to ascertain how far all this is absolutely necessary, and if the thing has been carried too far, to restrict it to something like reasonable limits. The Massachusetts Railroad Commissioners have been giving their attention to the subject, and have decided that locomotive whistling is considerably overdone. They assert that as a precautionary warning against possible danger, it is wholly unnecessary, and that people who are peaceably and legally in their dwellings should not be disturbed in order to warn reckless trespassers on railroad tracks of danger. They also assert that it is equally unnecessary for notifying railway employees of the approach of a train, as it is the special business of such employees to see or hear trains and be prepared for them; that the corporation should adopt a system of electric signals, which has been tried in Europe and elsewhere, and has proved reliable for giving notice both to employees and the public. The Commissioners further say that the whistle as a train-signal is greatly abused, and that the necessity for it on passenger trains is obviated by the introduction of the train-brake; and that on

freight trains its use is only necessary to a limited extent. As a danger signal, however, the whistle when properly used will always be of great service, although its value in this respect is now very much impaired by its promiscuous use on all occasions. If rigidly restricted to this purpose there would be little cause of complaint, as is proved by the experience of the Boston and Albany road, where its use, except as a danger signal, has been discontinued for nearly two years without any increase of accidents or other evil consequences, and this too without the adoption of automatic signals. These signals, however, are reliable, and should be made use of in all crowded neighborhoods. There is not the least necessity for using the whistle and bell as they are now used in many suburbs and towns in disregard of the comfort and rights of the public.

Railroad Accidents.

THE number of casualties from railroad accidents, according to the best estimates that can be made, is so small as to be almost insignificant when considered in connection with the total mileage of roads operated and the aggregate of passengers carried. Still, it is as bad for the victims as if the number were larger; and the question remains as to whether the yearly catalogue can not be permanently reduced to a smaller average by more efficient road service and management. Of late years, we have been so occupied in projecting and building new roads, and in operating to advantage those already built, that the precautions against accidents have been overlooked, especially such as involved large expenditure, and which have reference mainly to adequate protection of the track and to the capacity and discipline of employees. Our roads are very generally open highways with grade-crossings everywhere, even in large and populous towns, and the chances of collision are multiplied in a corresponding degree. This source of danger we have become accustomed, if not reconciled to, from long familiarity, and considering the extent of territory traversed, and the absence of any stringent legal obligation compelling companies to fence up their lines and provide safer crossings, it is probable that no immediate improvement will be made in this respect. The engine-runners must continue to look out for the cattle, and the people who cross the tracks must look out for the locomotives.

In the matter of general management, thorough discipline, and the selection of employees of a superior grade, we think that precautions against accident might be made much more effective than they are. In railroading, there is no detail so apparently trifling as to be unimportant, and when any thing is done, there should not only be a capable person appointed to do it, but there should also be some means of knowing that it is done. New rules are not, as a general thing, so much needed as the carrying into effect of those already in existence. It is the testimony of a high official connected with one of our leading roads, that the accidents which have recently occurred on it have resulted from the gross carelessness of employees. Now, this proceeds either from defective discipline, or incapacity on the part of such employees, or both. In either case, the responsibility rests primarily with the management. It is as easy, and about as satisfactory, to say that an accident was caused by a collision or a misplaced switch, as it is to say that a person's death was caused by his inability to breathe. The original and not the proximate cause is what we want to get at. Misplaced switches, as every one knows, figure largely among the causes of accidents, but the real trouble generally lies behind the switch, and consists, perhaps, of a cheap man employed in pursuance of a niggardly policy inaugurated at head-quarters to keep down expenses and swell dividends. The principal is in law responsible for the acts of his agent, and railroad managers should be amenable to the same code when such agent is unfit to perform the duties assigned him.

That a very considerable number of people will, within the next six or twelve months, be killed and maimed on our railroads is as certain as inexorable fate; and it is equally certain that such casualties will be due mainly to neglect. Each successive crash, with its attendant misery, will bring home to the consciousness of some one that *he* might have prevented it, but did not, from heedlessness, procrastination, or criminal lack of judgment. A suspicious wheel or a doubtful axle was trusted a day too long, the hangers of a brake-beam were considered sufficient without the additional guard of safety-straps, a trestle-bridge gave way which had not been properly inspected and was cheaply built at first, a switch-target was bent or broken, a bad rail-joint overlooked, a light misplaced, a signal displayed a minute too late, or some other oversight or irregularity occurred, the possible consequences of which were not sufficiently apparent to a stupid, dull-minded subordinate. The remedy for this, so far as a remedy is possible, is in a system of discipline which makes every employee realize his responsibility to such a degree as to render him habitually observant and thoughtful, as well as critical and exacting, with respect to every detail, however minute, which involves the safety of life and property. And as regards the strength of materials, it is better to err on the side of strength than of weakness. We know an old mechanic, one of whose maxims is that if any thing is made too strong, no one will find it out, but if too weak, all the world will know it. This applies to the number as well as the strength of safeguards in railroading; harm seldom results from too many, but almost always when they are too few.

There is, of course, a class of accidents that are unavoidable, and result from causes which, in the nature of the case, can not be foreseen and provided against, such as land-slides, a sudden fracture in material where no visible flaw existed, and others that might be named. But these are exceptional and comparatively rare. There is also another class for which the laxity of our law-makers is at fault. Every free-born American citizen naturally exults in the inalienable right of risking his own neck and limbs to any extent he sees fit, by jumping from trains or ferry-boats. This he considers his own exclusive business, unless harm results, and then he consults a lawyer to see if the railroad or ferry company can not be made to pay damages. In England, the exercise of this right is subject to restraint; or, rather, any foolhardy person can, if he chooses, risk his life, and gain a few seconds of time by leaping from a train before it has stopped; but an arrest, detention, and fine for so doing, make such saltatory feats of comparatively rare occurrence, and save a good many limbs and lives.

Gazetteer of Railway-Stations.

THIS is the title of a valuable and much-needed work which has just been issued by the National Railway Publication Company of Philadelphia. The volume contains 440 pages, is compact in form, and the arrangement of its contents such as to make it extremely convenient for reference. The list of railway-stations is very full, and embraces all that are named in the official time-tables of the roads of the United States and Canada, with many others of minor importance not so named. The location as to county and State is also given; also the population of each station or town connected therewith, and reference marks indicating such as have post-offices, telegraph, or express offices attached. The compilation of this portion of the work, although an exceedingly laborious task, has evidently been as thorough as the nature of the case will permit. New stations and post-offices are constantly being established and old ones abolished, or their names changed. These changes will be embodied in each subsequent edition of the work.

The volume also contains much additional information of special value to the business and traveling community, including a list of counties, county towns, and the times of holding courts in the several States; a list of the old and new names of roads, in which the original name or title is given in connection with that of the road or company into which it has since been merged by lease consolidation or otherwise; a list of railroads, river and stage routes operated by the several express companies; location of piers in New-York, Philadelphia, Boston, and Baltimore; express directory of Wells, Fargo & Co.; rates of postage, river distances, etc. Few volumes of its size contain as much valuable information, and none the particular information contained in this. The superior facilities of the compiler for obtaining correct data with respect to railroad operation gives assurance that the work is reliable and accurate. It should have a place in every business office. It will be sent, postage paid, on receipt of price ($1 in paper binding, or $1.50 in cloth), at the office of the company above named, 233 South Fifth street, Philadelphia.

THE firm of Parmelee & Bonnell, of Buffalo, manufacturers of lanterns, has recently been dissolved, and its business interests transferred to what has been known heretofore as the Buffalo Steam-Gauge Company, but which is now called the Buffalo Steam-Gauge and Lantern Company, Mr. W. H. Bonnell, of the above-named firm, having become one of the proprietors in connection with Tho. S. Ray, C. A. Marvin, and C. T. Ham, the former proprietors. By this consolidation of interests the facilities of the company for the manufacture of lanterns, head-lights, steam-gauges, and other articles in the line of their business have been materially increased. The already established reputation and well-known capacity and experience of these gentlemen in this branch of manufacture, entitle them to a liberal patronage. We refer the reader to the company's advertisement on another page.

A NEW and valuable work on *The Construction of Mill-Dams* has just been issued by James Leffel & Co., the proprietors of *Leffel's Illustrated Mechanical News*, Springfield, Ohio. The volume contains over 300 pages, with numerous engravings illustrating the various methods of construction. These methods are fully described, so that their relative merits can be readily understood. Those who have occasion to use water-power as a motor will find in this work more useful and reliable information on the building of dams than can be derived from any other source. The volume is cloth-bound, well printed, and will be sent by mail, post-paid, on receipt of price, $2.50. Address as above, or 109 Liberty street, New-York.

THE *Railroad Gazette* will soon publish in book form the "Catechism of the Locomotive," which has been continued in successive numbers of that journal for several months past. It will be a very attractive and useful volume for practical mechanics and others who wish to acquire or improve their knowledge of the construction and management of this wonderful machine.

The Chicago Railway Review has put on a new dress, and is much improved in its general appearance. Each number contains a well-digested summary of railroad news. Special attention is given to court decisions and legislation as affecting railroads, and the editorial department is well sustained. It is one of the best railway journals in the country.

THE regular monthly meeting of car-builders will be held on the 17th of September, at the rooms of the Association, 113 Liberty street.

THE official report of the proceedings of the Master Car-Builders' Association, at Cincinnati, is now ready for distribution.

MANY of the railroads now have in use a valuable lamp, called the "quick signal railroad lamp," which is simply a red light and a white light combined in the same lantern.

Recent Patents.

IMPROVED CAR-VENTILATING APPARATUS.—Henry A. Gouge, New-York City.—The inlet devices are placed at the alternate angles of the car. Each is made in two parts, with funnel-shaped mouths, the mouth of the one part being forward, and that of the other part rearward. The parts of the device unite into a single tube, which passes down through the roof of the car, and its upper part is divided into two passages, one for each mouth, by a partition, which extends a little below the roof. In the sides of the car, just below the roof, are formed openings leading into the tube. By this arrangement, as the car moves in either direction, the air passes in through the forward mouths of the devices, and passes down through the tube, which induces a strong current of air through the openings. Suitable arrangement enables the air to be heated before being introduced into the car; and by other devices, the forward movement of the car will induce an upward current of air through the device which draws the impure air from the car. By this construction also, a downward wind can not blow into the car, but will only induce an upward draft through the device.

IMPROVED RAILROAD-CAR STOVE. John H. Mahrenholz, New-York City.—Railroad-car stoves are usually so constructed that, when the car upsets or the stove is displaced by a violent collision or other cause, the car is frequently set on fire, and the roasting of the helpless passengers is added to the other horrors of a railroad accident. The present inventor arranges a closed top firepot and drop flue in a cylinder having an open-work top, so as to present a large area of heating surface, and to allow the air free access to the pot and flue on all sides, and free escape through the top of the cylinder. He also arranges a water-reservoir and steam-generator beneath the floor of the car. The stove is firmly attached to the floor of the car, and can not be readily displaced. It may be turned over or bottom-side up without discharging any fire into the car, and is, therefore, safe in cases of accident.

IMPROVED CAR-AXLE LUBRICATOR. John W. Bollman and John G. Ernst, Baltimore, Md.—This invention relates to a novel and economical mode of applying lubricants to car-axles, and consists in using a spring, one or both of whose ends clasp a side or sides of the journal; while, on the inner side of each of these ends is attached the end of a wick which is saturated with and has part of its length resting in the lubricant.

IMPROVED CAR-WHEEL. Isaac Dripps, Philadelphia, Pa.—The wheel is formed of wood and metal, the object being to render it light, elastic, and yet strong and durable.

A Railroad Scene.

"BURLEIGH" writes from Washington to the Boston *Journal*: "An amusing incident occurred the other day on one of the trains from Boston to this city. The cars were very crowded. An elegantly-dressed woman occupied an entire seat. Her bundles, bandbox, and bag were piled artistically. She was oblivious to the fact that passengers were rushing back and forth to obtain sittings. More than one gentleman drew himself up in front of the imperious dame, and silently pleaded for the vacant spot. She fanned herself leisurely, lolled in the seat, and evidently thought things were very comfortable, as they were. 'Is that seat occupied, madam?' said a well-dressed gentleman, very politely. 'Yes it is,' was the snappish reply. The man walked on. In half an hour the door opened, and in walked a tall, rough fellow, coarse as a Polar bear. His huge beard was uncombed and stained with tobacco-juice. His clothes were ill put on, and smelt of the stable. He was ungloved and brawny, and weighed full two hundred. He ran his eye along the car, and caught the seat on which our lady was sitting. He made for it. With great deliberation he seized bundle, bandbox, and bag, put them plump into the lap of the lady, and sat down in the vacant spot as one who intended to stay. If looks could have annihilated a man, there would have been a corpse in that car about that time. The man seemed very much at home. He whistled; he spit; he stroked his beard; he threw round his huge arms, and chuckled inwardly at the evident rage of the woman. She left the cars at New-Haven, and had hardly gone, before the gentleman who was refused the seat reappeared. To some gentlemen who seemed to take a great interest in the proceedings, he said: 'Did you see how that woman treated me?' 'Yes.' 'Did you see how she was come up with?' 'Yes.' 'Well, that man is a horse doctor that sat down beside her. He belongs to Bull's Head. I gave him $1 to ride with that woman as far as she went.' The car roared, and the whistle and bell of the locomotive voluntarily joined in the chorus."

Transfer Graining.

No artificial graining, however skillfully performed, can equal in beauty the curves and lines of the natural wood; and consequently any method by which these can be quickly and cheaply transferred to other surfaces would be a great improvement upon ordinary hand-graining. Such a method, we are informed, has been discovered by Cross & Bastine, of this city, who have so far perfected it as to leave little doubt of its success. The process is simple. The operator takes a piece of wood, the grain of which is to be transferred, and applies the graining-color to its surface; then with a piece of wood or thick sole-leather he scrapes the color off, leaving the pores filled and the surface perfectly clean. A roller with a smooth, elastic surface is then passed over the design, absorbing the color left in the pores, so as to deposit it on any panel or other wood, reproducing an exact copy of the natural grain. The design can be varied to almost any extent by starting at different points, or taking different curves and angles on the wood from which the impression is obtained. The set of rollers is so arranged that the smallest corner in a room, the mouldings of the panels, the skirting, down to the very floor, can all be evenly and artistically manipulated. The operator can do five times the amount of work, and although performed by unskilled labor, can make a vastly superior job than can be done by hand.

The Heberlein Brake.

THE foreign scientific papers give considerable space to the descriptions of experiments made with the new Heberlein brake. It is not a continuous brake, though it may be fitted to every car in the train—the plan being, however, to divide the train into sections, including one brake-car in each, and the operator in this car can apply the brake to his own car, and to one or more others in connection with it.

These brakes are applied to the wheels by the agency of a friction-pulley, which engages with a friction-wheel on one of the axles of the engine or of the brake-car. The revolution of this friction-wheel winds up a flat link-chain, like that of a watch, and this, pulling on a set of rods under the cars, applies the blocks to the wheels. The pulley is of iron, but the friction-wheel on the axle is built up of wooden segments, with grain radiating, and jammed between two plates set up tight with screws and nuts. The wheels of the brake-car are not intended to stop running. The friction-wheel instantly revolves, and its friction against the iron pulley supplies the force which applies the brake.

The mode of throwing the apparatus into action is exceedingly simple. A line extends over the roofs of the seats from end to end of the train. By pulling this cord, a detent is thrown out of gear, and the friction-pulley, which is hung on a weighted bell-crank lever, is suffered to fall into contact with the friction-wheel on the axle, and the brake is applied as soon as the train has run far enough to wind up the slack of the chain. The cord is kept taut, so that in case a car runs from the track or becomes detached, a strain is brought upon the line, and the brakes immediately applied.

A New Railroad Official.

A CORRESPONDENT traveling in the North-West, reports that he noticed on the platform of the cars of the Chicago, Milwaukee, and St. Paul Railroad, an officious and rather sharp-looking young man who insisted upon seeing the tickets of passengers before they entered. Missing him after the train got under way, our informant inquired of one of the brakemen what had become of that *other* brakeman who was on the platform with him before the train started? "Brakeman!" was the contemptuous reply, "he an't no brakeman; he's a *Granger Bouncer!*"

PROBABLY the best specimen of an American highway to be found anywhere is the Pennsylvania Railroad, between Pittsburg and New-York. In solidity of construction, superiority of bridge architecture, and smoothness of track, it is unrivaled. Throughout its entire length, it is laid with a double track of steel rails, weighing sixty-seven pounds to the yard. These rails are fastened on oak ties, and so arranged that the connection on one side comes opposite to the centre of the rail on the other, thus preventing the uncomfortable and monotonous jar experienced on tracks constructed according to the ordinary plan. The rolling stock is as near perfection as human ingenuity and skill have, up to the present time, been able to make it. Locomotives and cars are alike built by the company in their own shops, and in the details of materials, design, and finish, combine the highest excellence attainable. To all this is added a rigid policy of management, exacting the utmost care and courtesy from employees of every grade, and the application of those effective safeguards—the Westinghouse air brake, and the block signal system—showing that whatever can be accomplished for the safety of travelers has been done on this great line of railway.

AN English writer, referring to the desire on the part of some railway-carriage builders in England, to make up for inferior quality of material by increased quantity, says: "We once heard a railway official who had been examining some new carriages purchased by a company with which he had nothing to do, ask what they cost and what they weighed. He was told, and replied at once, 'Good gracious! how you have been taken in! Why, we bought some carriages not a week ago from the same firm; they don't seat so many people, and they weigh a ton a carriage more than yours do, for the same money.' This represents a very common idea of economy. We recollect a firm in the North advertising, as their principal claim to patronage, that they make the heaviest portable engines for the power in the world. The system applied to railway-carriage construction has, however, many objectionable features, which we regret to see are not quite as fully appreciated as they ought to be."

A CORRESPONDENT of the *Railroad Gazette* says that the smallest locomotive in the world can be seen at the shops of the South Side Railroad, at Petersburg, Va. It is of the Mason pattern and of the ordinary American plan, with four wheels coupled and a pair of forward trucks; drivers 8 inches in diameter, cylinders 2 x 3½ inches, capacity of boiler about 2½ gallons to the third gauge-cock, the entire length of engine and tender less than 4 feet, gauge only 9 inches, and the whole weighing, in full working order, less than 250 pounds. It is a complete engine in every particular, and has all the attachments of the ordinary Mason locomotive. It was built under the direction of Capt. James Robinett, the master mechanic of the road.

SOME contracts were let recently at Strasbourg for freight-cars for railroads in Alsace and Lorraine at prices given below. These four-wheeled European cars are not small vehicles like English "wagons," but calculated to carry 22,000 pounds each, and so fully equal in capacity to our eight-wheeled cars: 100 four-wheeled cars for carrying rails, at $335 (reduced to American currency) without brakes, and $440 with brakes; 50 four-wheeled cars for carrying timber, at $385; 50 two-story stock cars, at $555 without brakes, and $700 with; 150 coke cars at $430 without brakes, and $530 with; 200 merchandise cars without brakes, at $370; 540 merchandise cars with brakes at $470.

THE Chicago and Northwestern Railway Company have within a few weeks discharged 1000 employees, and have abandoned sundry contemplated improvements along their line, which would have involved an expenditure of about $1,000,000. These included a large freight depot at Milwaukee and the completion of the car-shops at Austin. The reason assigned is the reduction of earnings caused by compliance with the Iowa and Wisconsin laws.

MR. MILTON SESSIONS has been appointed master car and bridge builder of the Keokuk and Des Moines Railway, in place of W. E. Smith, resigned. Mr. Sessions was for a long time master car-builder of the Vermont Central, which road he left a little over a year ago to become general manager of the Taunton Car Company. Mr. Samuel W. Wakefield has been appointed master mechanic of the road in place of James Lamb, resigned.

THE Michigan Central Railroad has 175 miles of double-track steel rails between Detroit and Chicago, and the expense of the repairs of machinery has thereby been considerably reduced.

THE Patten Car Works, of Bath, Me., have just received an order from the Dominion government of Canada for three first-class passenger-cars for the Inter-Colonial Railway of Canada.

A BRIDGEPORT, Connecticut, man has invented an entirely new plan for constructing railroad-cars. The model is constructed of brass tubing; the only wood used is in the flooring of the cars and the platform of the trucks. The cars are to be covered with metal, and, if necessary, nickel-plated. There is a guard connected with the trucks, which, it is claimed, will prevent a train from running off the track.

A FEW days since, the roadmaster of the Rock Island road, with a companion, traveled from Washington to Muscatine on a hand-car, propelled entirely by a sail about six feet square. The strong wind blowing at the time enabled him to make the trip—forty miles—in just two hours, the average time made by passenger-trains.

THERE are Pullman cars on all the lines of railway in Upper Italy.

THE Canadian way of measuring a tree is said to be as certain as it is grotesque. You walk from the tree, looking at it from time to time between your knees. When you are able to see the top of a tree in this way your distance from the root of the tree equals its height.

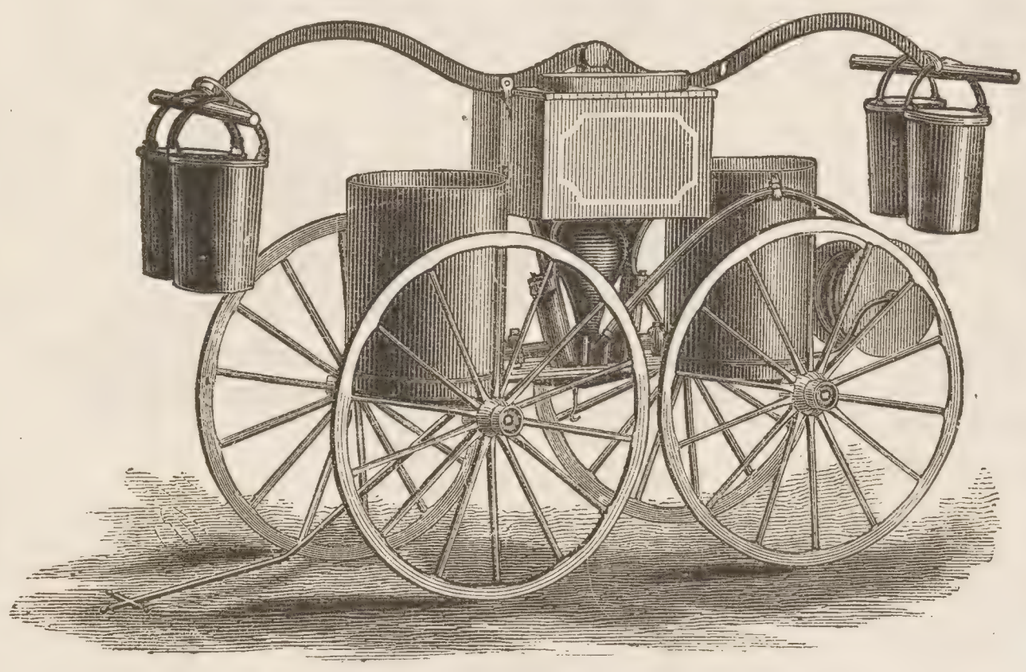
IN American building, there is very little of what may be called street effect, owing to lack of continuity of horizontal lines, and the discord arising from ill-adjusted successive façades.

PIPE-CUTTING AND THREADING MACHINE.—We desire to call attention to a very useful machine patented by W. D. Chase, of the Chase Manufacturing Company, of this city, for cutting and threading pipes rapidly and cheaply, and by the use of which a boy can do as much or more work than two men with the old appliances. It supplies a want long felt by machinists. For a more particular description, accompanied with an illustration, the reader is referred to our advertising pages.

The "Little Giant" Chemical Fire-Engine.

THE property annually destroyed by fire in this country is enormous, and an immense proportion of this loss results from the lack of suitable means for preventing small fires from growing into large ones. When a large building or a whole block is in a blaze, threatening an entire town with destruction, the efficiency of a well-organized fire department and powerful steamers is very apparent; but to arrest a fire at the start, something is required less ponderous and unwieldy—some simple and ready appliance that can be effectively used by a half dozen or less number of persons in a sudden emergency, without parade or confusion or waiting for orders through an official trumpet.

Such an appliance has been found in the "Little Giant" Chemical Fire-Engine, illustrated in the engraving. Unpretending in its dimensions, simple in construction, compact, easily handled, portable, and of small cost, it is at the same time sufficient singly and alone to extinguish any conflagration in its incipient stages, or even when it has spread through an average-sized building. With the exception of wheels and brake-arms, it is constructed entirely of metal, and weighs about 500 pounds. In the centre is a small double pump with an air-chamber like that of an ordinary fire-engine. On each side of the pump, and communicating with it, is a copper tank holding about 20 gallons. Above are two boxes, one for acid, and another for soda. Each tank is filled or partially filled with water, and for each bucket of water a scoop-full of acid is put into one tank, and a like quantity of soda into the other. This is but the work of a moment. The machine is then ready for action, and with only four persons at the brakes, will send a stream $\frac{5}{16}$ of an inch in diameter fifty feet from the end of a fifty-foot hose; or, if necessary, 100 or 150 feet of hose may be used, so as to quickly reach fires in the upper stories of high buildings. The acid and alkali solutions are united in the pump, and the extinguishing power of the water greatly increased by the generation of carbonic-acid gas. The use of chemicals may be suspended at any moment and water alone used, as circumstances may require.



The superior effectiveness of these machines has been demonstrated by severe and repeated tests in various parts of the country. Their advantages may be summed up in a few words. They are always ready for instant use; can be worked by a small number of hands; are not liable to get out of order; they act upon the fire *itself*, and prevent its spread without damaging property in the vicinity by a deluge of water, and are no less effective and valuable as an auxiliary force than when acting alone. For cities, villages, factories, railway-shops, etc., they are indispensable, and can be supplied at a cost of $300 each, including 50 feet of hose, 4 rubber buckets, and 100 pounds of chemicals.

Circulars with full particulars, and containing numerous testimonials from parties of the highest standing, may be had by applying to Vose, Dinsmore & Co., Agents, 32 Warren street, New-York.

Facetiæ.

THERE was an old couple at the Central depot yesterday, waiting to go through to the West, and they seemed loving enough until the old man went out and returned smoking a five-cent cigar and with his hat slanting over his left ear. The wife looked at him twice before she could recognize him, and then opened her mouth and said, "What'd I tell ye, Philetus Remington, before we left New-Jersey? Didn't I say you'd go and make a fool of yourself the first chance you got?" He tried to pacify her by saying that the cigar cost only five cents; but she shouted, "You teased and teased till I let you git your boots blacked; then you wanted some soda-water; then you bought apples on the train; and here's another five cents thrown away! It all counts up, and if you don't die in the poor-house, then my name an't Sary!"

A SMALL boy approached the great showman, Barnum, in Montpelier, the other day, and asked him what he would give him for a cherry-colored cat. "Ten dollars," replied Barnum, "if it is really cherry-colored." Soon the boy returned to Barnum's hotel, and unloaded a black cat at Barnum's feet. The showman saw the point, and paid the youngster ten dollars, with the remark, "Boy, you've stolen my trade."

"WOULD my little Ezra," asked a fond mother, "like to be a missionary, and go preach to the suffering heathen?" Tears — bright pearly drops of feeling—glistened in little Ezra's eyes as he murmured, "No, I wouldn't; but I'd like to be on the perlice long enough to put a tin roof on the big lummux that stuck shoemaker's wax on my seat to-day at school."

"MYNHEER, do you know for what we call our boy Hans?" "Do not, really." "Well, I tell you. Der reason dat we call our boy Hans is, dat ish his name."

"DAD, if I were to see a duck on the wing, and were to shoot at it, would you lick me?" "Oh! no, my son; it would show that you were a good marksman, and I would feel proud of you." "Well, then, dad, I peppered your old Muscovy as he was flyin' over the fence to-day, and it would have done you good to see him drop."

THE performances of the locomotive-whistle, we are told, have been systematized on a Western railroad. Seven whistles are to indicate "down brakes;" thirty-two whistles, "up brakes;" forty whistles and two snorts, a "back-up." The instructions add: "In case of doubt, whistle like the d—l;" at street-crossings, "whistle considerably." Again: "Always whistle before dinner. Require the fireman to keep the whistle-valve open during dinner. After dinner, whistle and squirt water, then back up. Then go ahead with a whistle, a squirt, and a ring."

SCOTT COUNTY, MINN., contains an extensive Limburger cheese factory. The cheese is declared to be "ripe" when a piece the size of a bean will drive a dog out of a tan-yard.

A YOUNG man at San José, Cal., bet that he could get a billiard-ball into his mouth. He succeeded, and hereafter will get the ball in quite easily. The doctor had to rip his mouth a little to get it out.

A LA CROSSE "brother," in the course of a fervent prayer at a Thursday night meeting, lately, added, "And that fellow who stole my horse—hit him with a thunder-bolt before he gets into Iowa."

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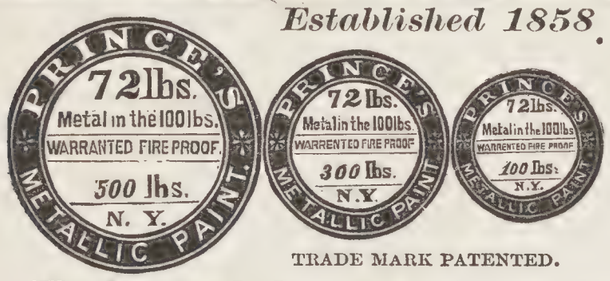

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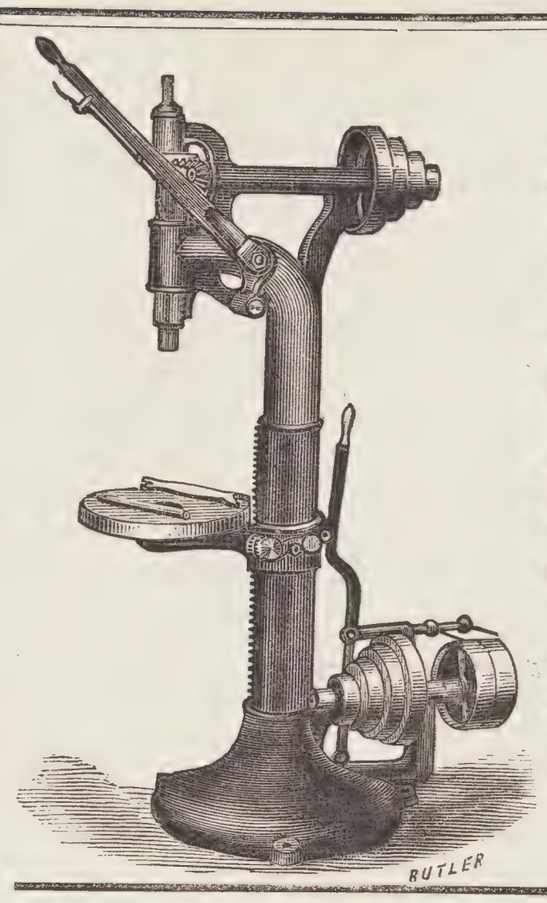

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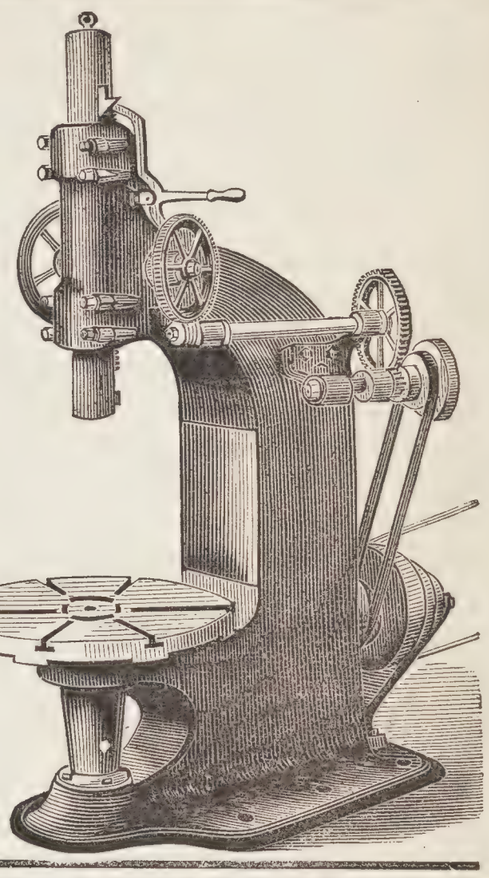

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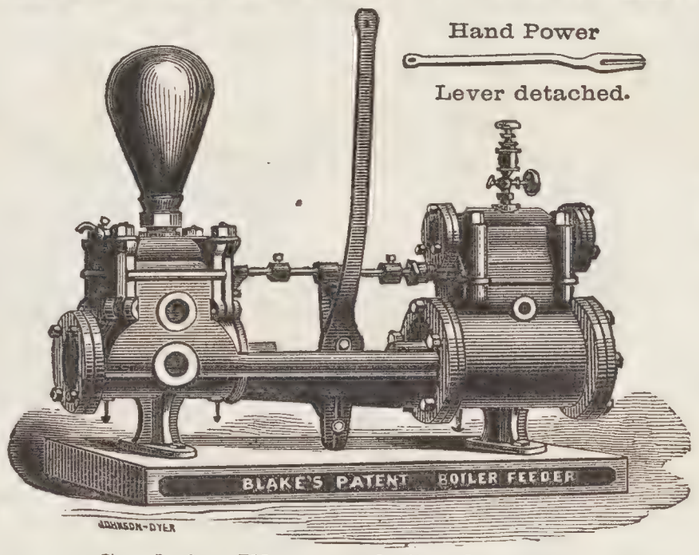

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PENNSYLVANIA RAILROAD—NEW-YORK DIVISION, JERSEY CITY, July 11, 1873.

GEO. W. BARKER, ESQ., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872, I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your resquest herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

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Arlington Car Manufacturing Co	Arlington, Vt.
Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg N. C.
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Corunna Car Co	Corunna, Mich.
De Pere Iron-Works	De Pere, Wis.
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Detroit Car and Manufacturing Co	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
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Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Fremont Car Co	Fremont, Ohio.
Gardner, F. & Co	Carlisle, Pa.
Gill, John L	Columbus, Ohio.
Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
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Lebanon Manufacturing Co	Lebanon, Pa.
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Mansfield Machine-Works	Mansfield, Ohio.
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Pittsburg Car-Works	Pittsburg, Pa.
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Barney & Smith Manufacturing Co	Dayton, Ohio.
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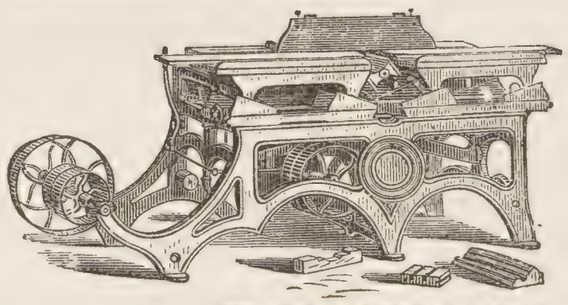

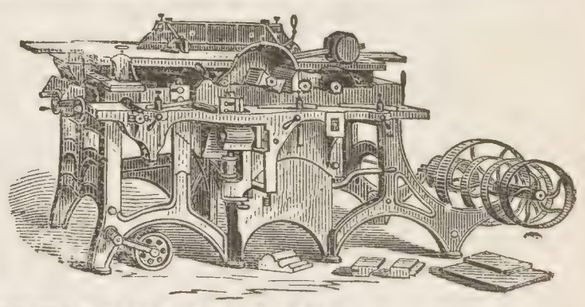

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Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago' Burlington & Quincy	‡Geo. Chalender	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan	W. H. Dunham,	Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P.Du Chien Div		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div		John Baillie	Milwaukee, Wis.
Iowa & Minn. Div	J. Pettee	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Cincinnati & Terre Haute	M. P. Wood		Terre Haute, Ind.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster. Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M.W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passampsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. NitterhouseChambersburg, Pa.	
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit. Mich.
Detroit. Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson CanalCo	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G.Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East-Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		New-York City.
Erie Railway	‖Robert Wallace		Susquehanna, Pa.
Erie Railway	‖V. Blackburn		Jersey City, N. J.
Erie Railway	‖F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	W. E. Cooper	W. E. Cooper	Hornellsville, N. Y.
Erie Railway		Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown. Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	J. W. W. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman	T. M. Preval	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland, Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**H. L. Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio
Indianapolis & St. Louis	A. J. Sanborn	R. B. More	Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft.Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D. Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas	Chester, S. C.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey	E. R. Brown, Mauch Chunk, Pa.	South-Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	A. Mitchell		Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk. Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo. N. Y.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, Ky.
Lake Superior & Mississippi	**H. A. Towne		St. Paul, Minn.
Lake Shore & Tuscarawas Valley	Charles Fellows	J. D. McIlwain	Black River, Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Memphis & Little Rock	Tho. Rennells	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere, Wis.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C D. Wall		Girard, Ala.
Mobile & Ohio	B. S Skates	John McHugh, I. T. Booth	Mobile, Ala. Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum		Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford.		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem.	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland			Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	C. E. Scruton		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson	Jas H. Anderson	Providence. R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven. Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens.	Hartford, Ct.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D Billings	McComb City. Miss.
New-Orleans, St. Louis & Chicago.	§§L. H. Sellars.		Water Valley, Miss.
Naugatuck	Henry Hanford	George W. Gray.	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon. Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Northern New-Hampshire	James W. Lander	Albert Langmaid	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Ohio & Mississippi		G. Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott		East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart	J. G. Wilson	Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa.
	W. L. Holman		Kane, Pa.
	W. T. Smith.		Erie, Pa.
	§§T. N. Ely		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis			
Pittsburg & Columbus Division	E. Pierce	Thos. D. Furgusen	Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati, Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns		Connellsville, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland. Me.
Port Royal.	Wm. Campbell	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G Taylor	H. G. Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y

Q

Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.

R

Raleigh & Gaston.			Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River.	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn. N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Seaboard & Roanoke	§A. Pendleton		Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Laughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Mames	W. W. Peirce	Selma. Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N.Y.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.

T

Taunton Branch.	W. M. Parks	J. G. Codding	Taunton, Mass.
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	W. H. Hipple		Marshall, Texas
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind.
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western,		U. H. Kohler	Toledo. Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria. Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha. Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland. Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. C. Fischer	Hudson, Wis.
Worcester & Nashua	Albert Griggs	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY

OF

Railway Superintendents and Purchasing Agents

THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	C. C. Smith	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Blossburg, Corning & Tioga	A. H. Gorton	R. J. Burnham	Watkins, N. Y.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	C. Hamilton		St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee, Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	S. C. Baldwin		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡W. B. Strong		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen		Chicago, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S S. Merrill	Robert Wason	Milwaukee, Wis.
Chicago, Pekin & Southwestern	N. V. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind
Cincinnati & Terre Haute	Matt. P. Wood	Matt. P. Wood	Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati Lafayette & Chicago	E. H. Waldron	E. H. Waldron	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division.	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Colorado Central	P. J. Nichols		Golden, Col
Columbus & Hocking Valley	J. W. Doherty	J. W. Doherty	Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese	C. D. Childs	Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie			New-York City.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,		Henry Bowman	New-York City.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo. N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas.L.Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw.Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galvestou, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk		John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb, W. J. Hilton, L. W. Morse	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central.	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Houston & Gt. Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Midland	W. W. Fagan.		Topeka, Kan.
Kansas Pacific	Edward S. Bowen		Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo H Briggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Lackawanna & Bloomsburg		G. W. B. Cushing.	New-York City.
Lake Erie & Louisville	I. H. Burgoon.		Fremont, Ohio.
Lake Ontario Shore	George Bennett.		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card.	W. L. Holden.	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith.		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine.	A. C. Armstrong.	Cleveland, Ohio.
Kalamazoo Division	William Wheaton.		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning.	Allan Bourne.	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell.	R. B. Gemmell.	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre.		Bethlehem, Pa.
		L. Chamberlin.	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahony Division	James I. Blakslee.		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell.		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman.		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	J. C. Hadley.		Terre Haute, Ind
Long Island	L. D. Morford.	Oliver Charlick.	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink.	G. C. Breed.	Louisville, Ky.
Clarksville Division	Robert Meek.		Clarksville, Tenn.
Memphis Division	J. T. Flynn.		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb.		Nashville, Tenn.
So. & North Ala. Division	Robert Meek.		Birmingham, Ala.
Louisville, Cin. & Lexington	John McLeod.	Geo. Skinner.	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day.	J. R. Parker.	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb.	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	J. W. Robertson.	J. W. Robertson.	Macon, Ga.
Macon & Western	Capt. G. I. Foreacre.		Atlanta, Ga.
Maine Central	L. L. Lincoln.	G. A. Phillips.	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin.		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody.		Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur.	R. B. Hoover.	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch.	S. Schoch.	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell.	J. L. Caldwell.	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown.		Carthage, Mo.
Memphis & Little Rock	A. S. Livermore.		Memphis, Tenn.
Memphis & Charleston	W. J. Ross.	J. B. Galloway.	Memphis, Tenn.
Michigan Central	H. E. Sargent.		Chicago. Ill.
Michigan Central	§C. H. Hurd.	John Newell.	Detroit, Mich.
Grand River Valley Division	J. Desmond.		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush.		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham.		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke.		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor.		Port Hope, Ont.
Midland Pacific	J. N. Converse.	M. A. Showers.	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed.		Milwaukee, Wis.
Western Division	J. S. Buck.		Appleton, Wis.
Mineral Point	G. W. Cobb.	G. W. Cobb.	Mineral Point, Wis.
Mississippi & Tennessee	M. Burke.	M. Burke.	Memphis, Tenn.
Mississippi Valley & Western	*Josiah Hunt.		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill.		Warsaw, Ill.
Missouri, Kansas & Texas		G. M. Babcock.	Sedalia, Mo.
Cherokee Division	L. H. Hamilton.		Parsons, Kansas.
Choctaw Division	S. G. Eddy.		Holden, Mo.
Eastern Division	Mark M. Towne.		Hannibal, Mo.
Sedalia Division	Mark M. Towne.		Sedalia, Mo.
Neosho Division	L. S. Hamilton.		Neosho Falls, Kan.
Missouri Pacific	A. A. Talmage.	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning.	Allan Bourn.	Kansas City, Mo.
Mobile & Ohio	A. L. Rives.	C. E. Rushing.	Mobile, Ala.
Alabama Division	Cecil Fleming.		Mobile, Ala.
Mississippi Division	E. S. Hosford.		Macon, Miss.
Tenn. & Ky. Division	M. M. Miller.		Jackson, Tenn.
Mobile & Girard	W. L. Clark.		Columbus, Ga.
Mobile & Montgomery	G. Jordon.	G. Jordon.	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham.	B. Dunham.	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
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New-Haven & Derby	E. S. Quintard.		New-Haven, Ct.
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Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold.		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone.		" " "
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Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn	J. H. Stewart	Madison, Wis.
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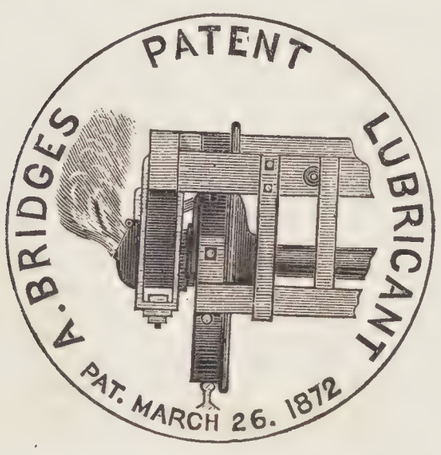

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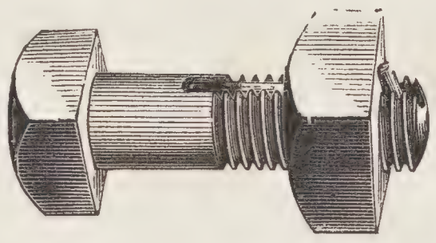
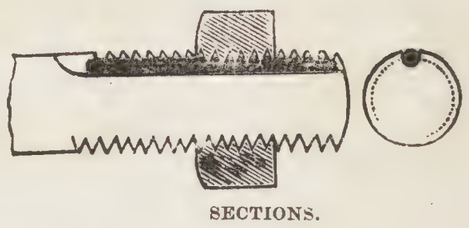


"CUMMING NUT-LOCK,"

Patented

June 16, 1868,

August 23, 1870.



SECTIONS.

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This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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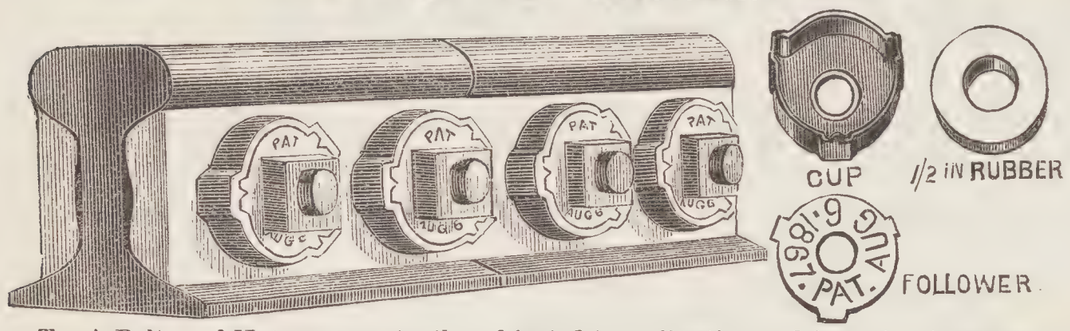
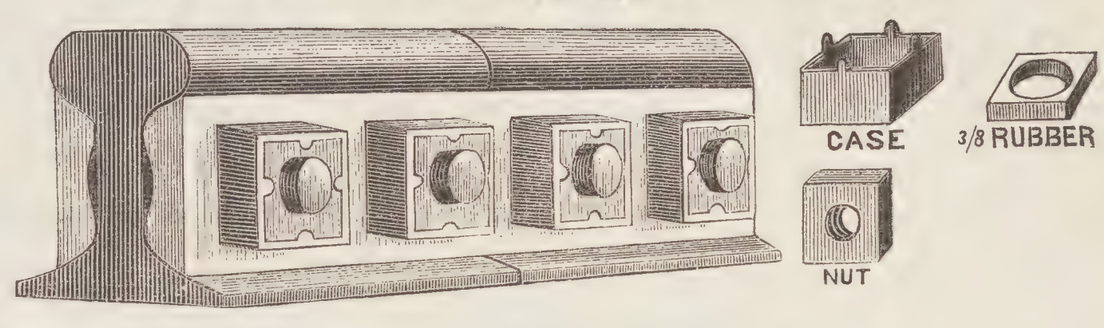


"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

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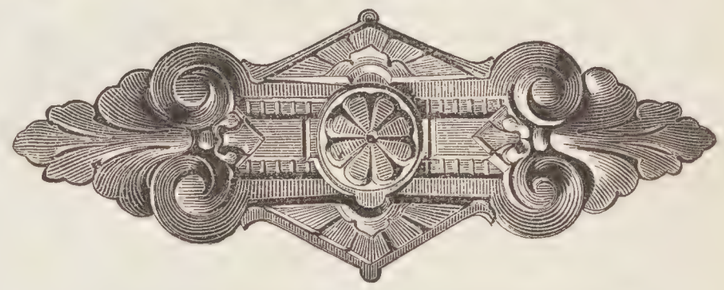

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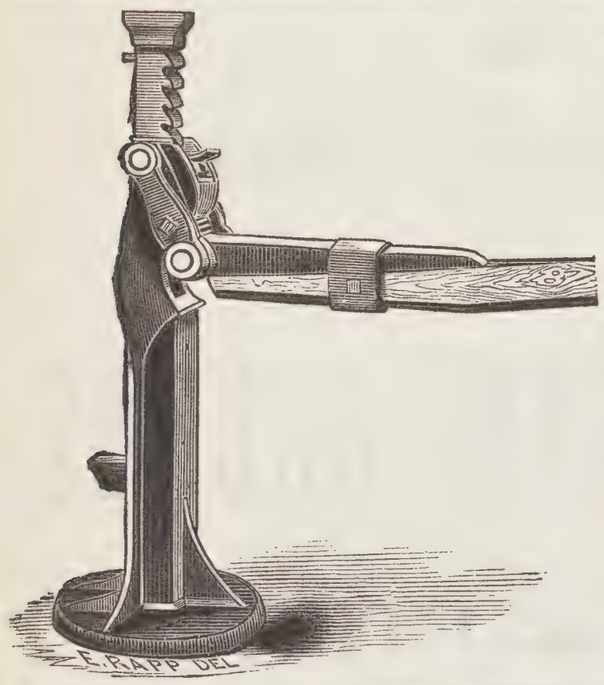

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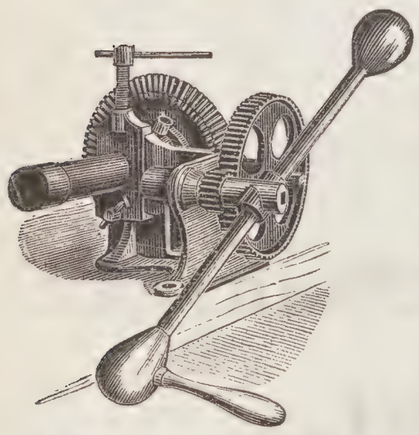

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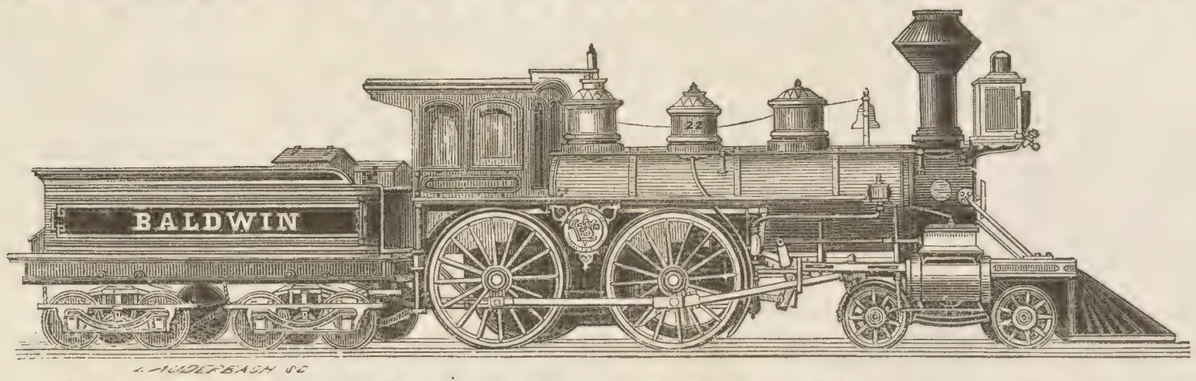

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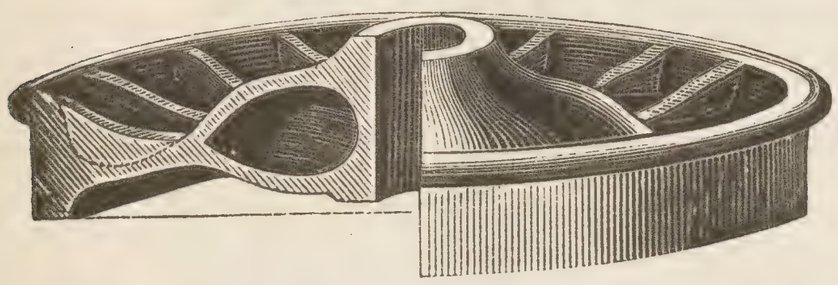

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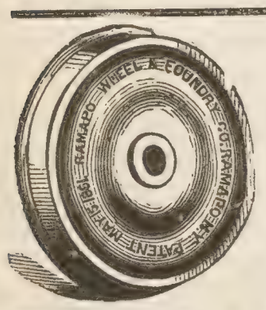

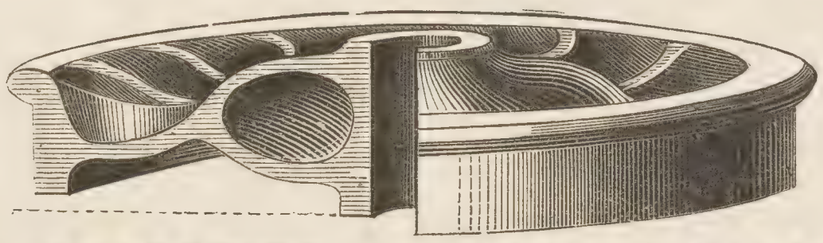

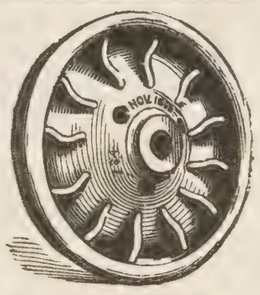

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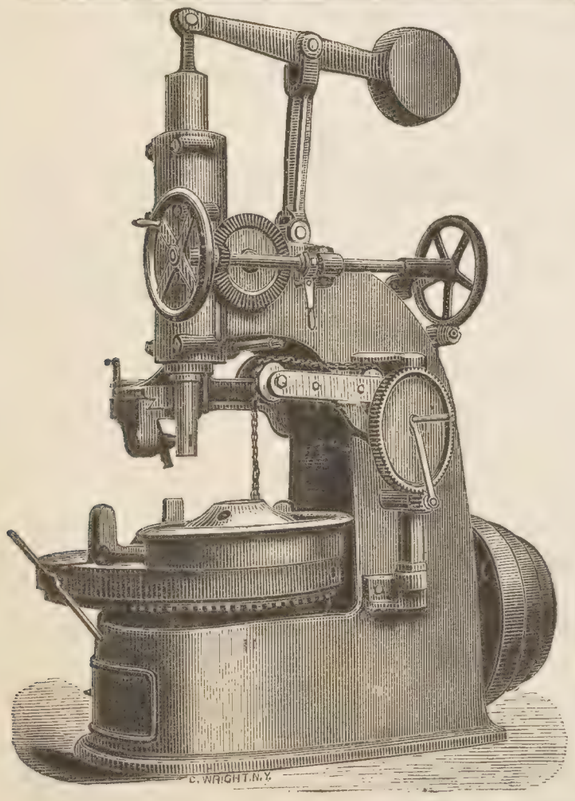

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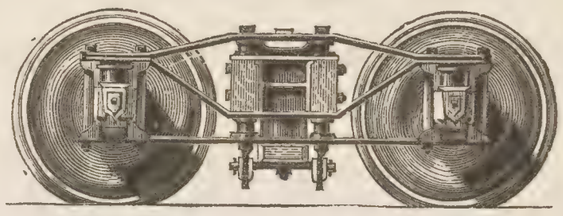

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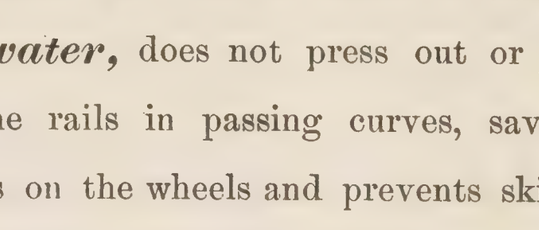
It takes the curve like a boat in the water, does not press out or endanger the rails in passing curves, saves the flanges on the wheels and prevents skidding. It is elastic, and enables the motive power to start with greater ease and with a greater number of cars, the vibration overcoming the inertia or rest upon the track. The leading features of the patent are the mechanical means employed by which the result is obtained. For the mechanical combination, the reader is referred to the patent issued April 24, 1866.



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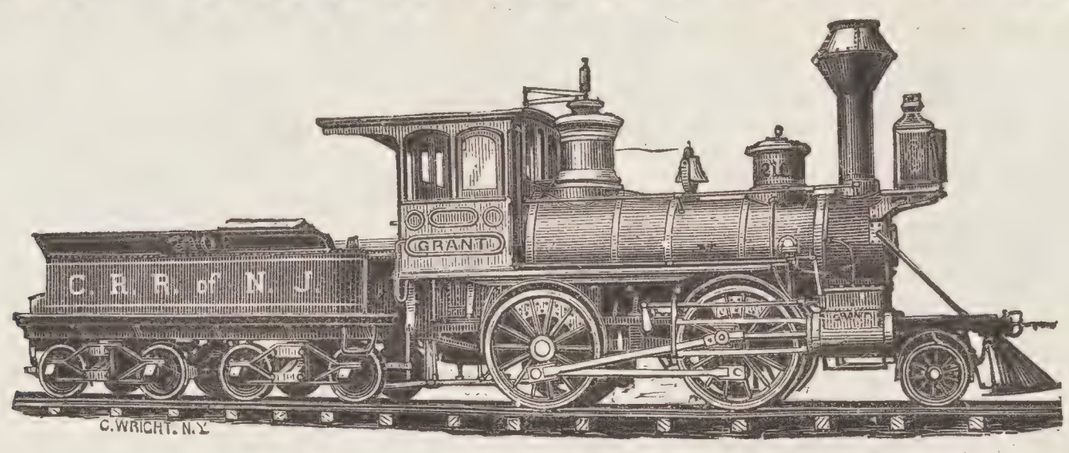

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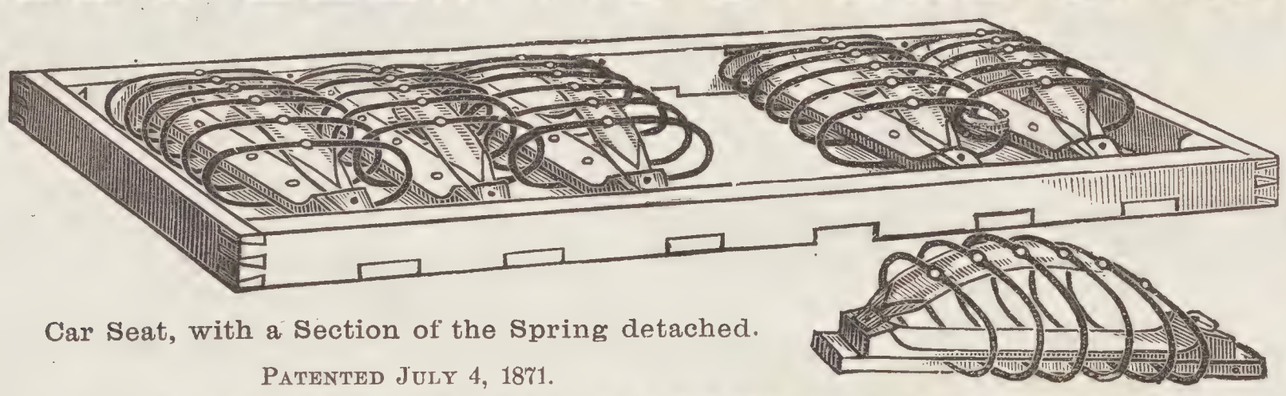

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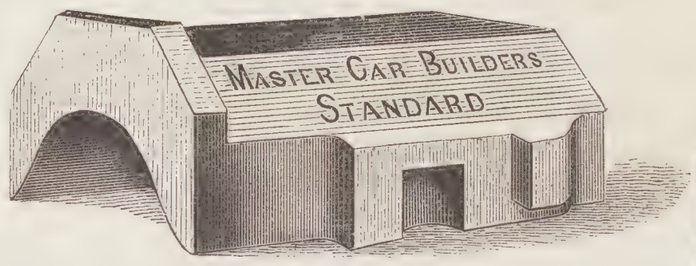

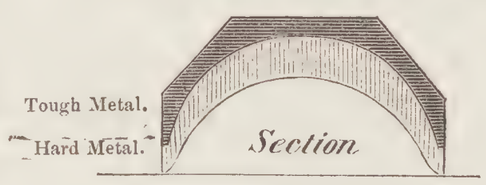

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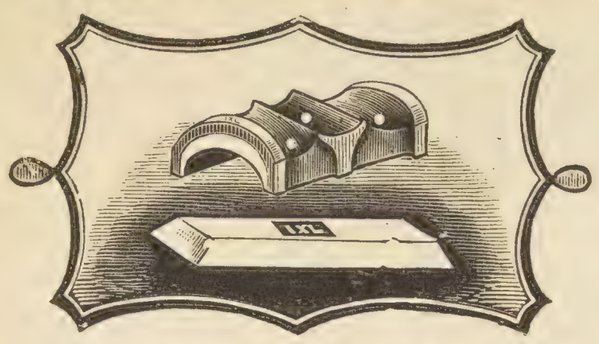

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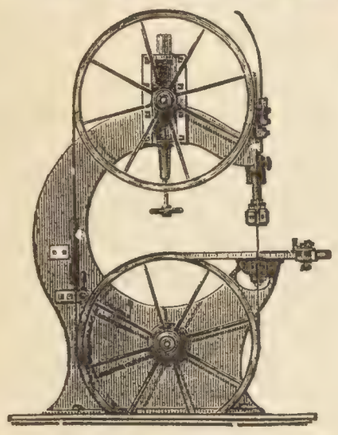

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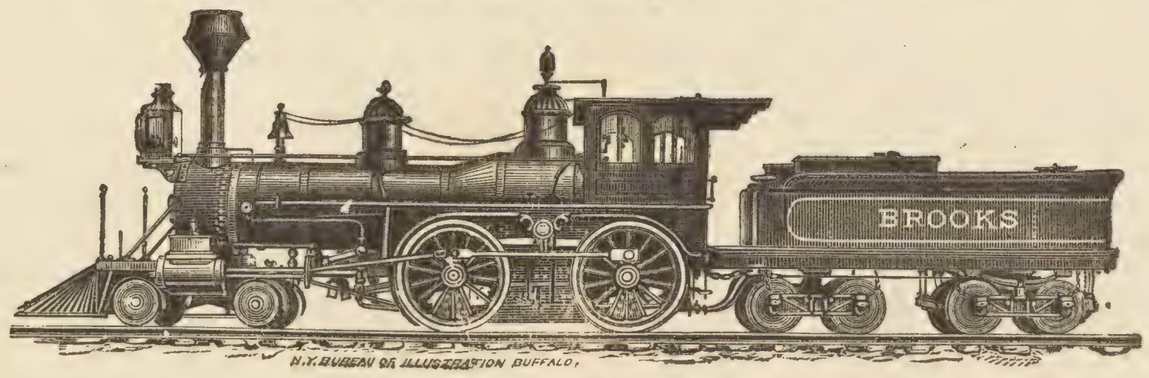

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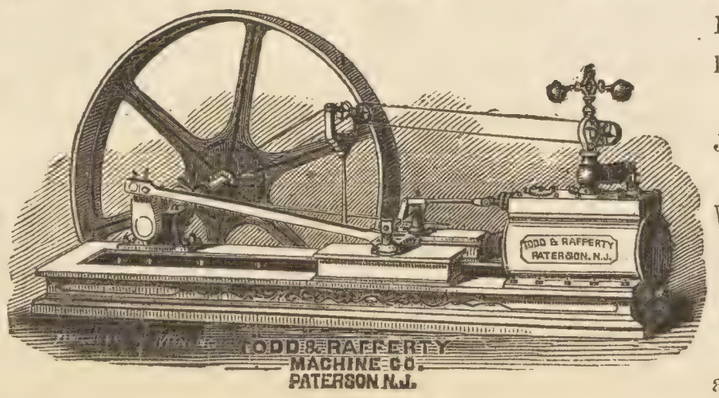

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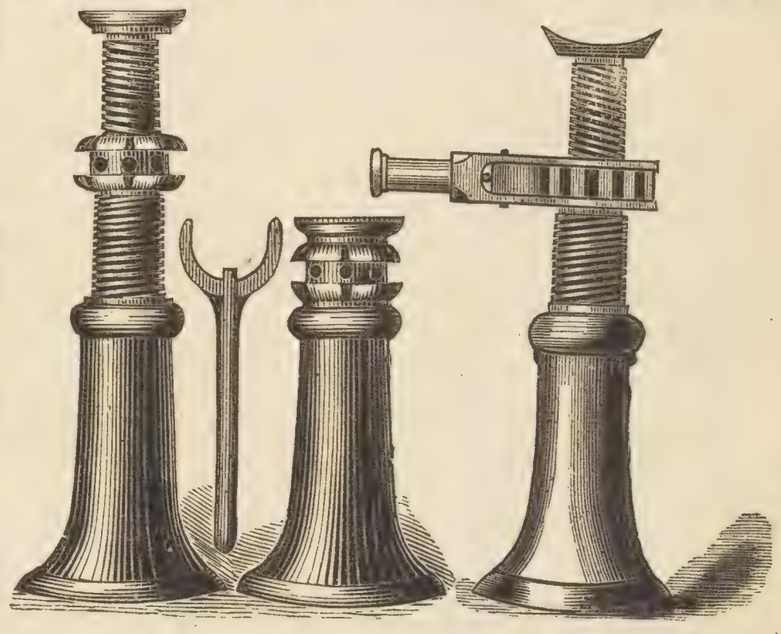

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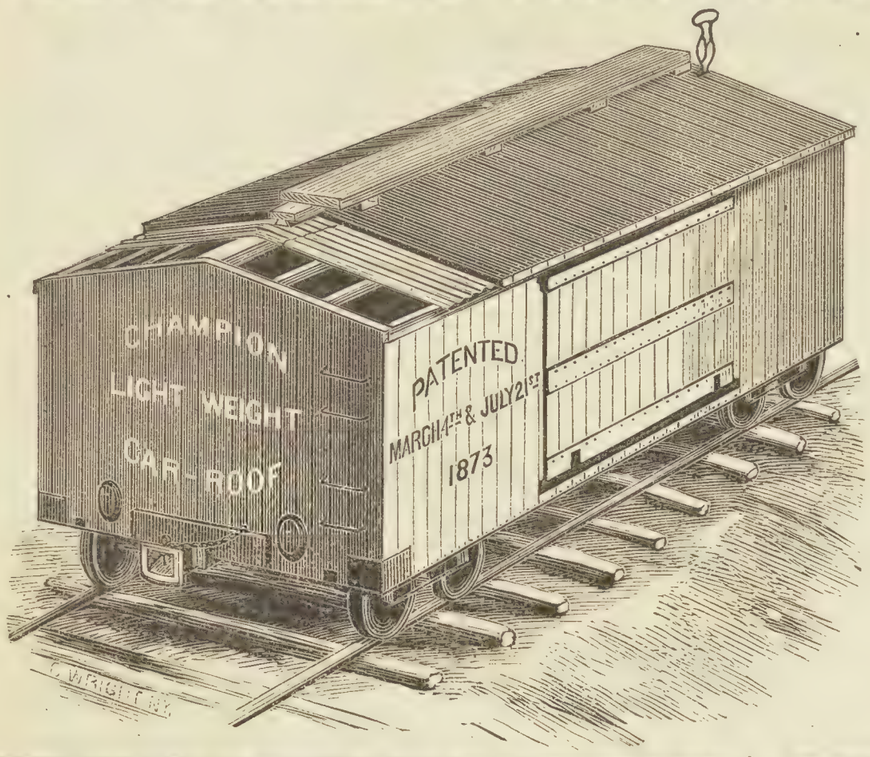

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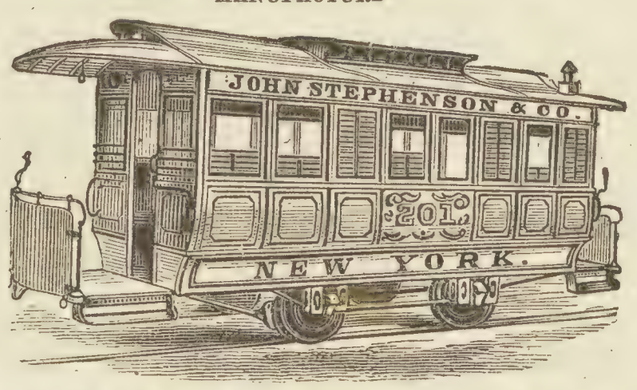

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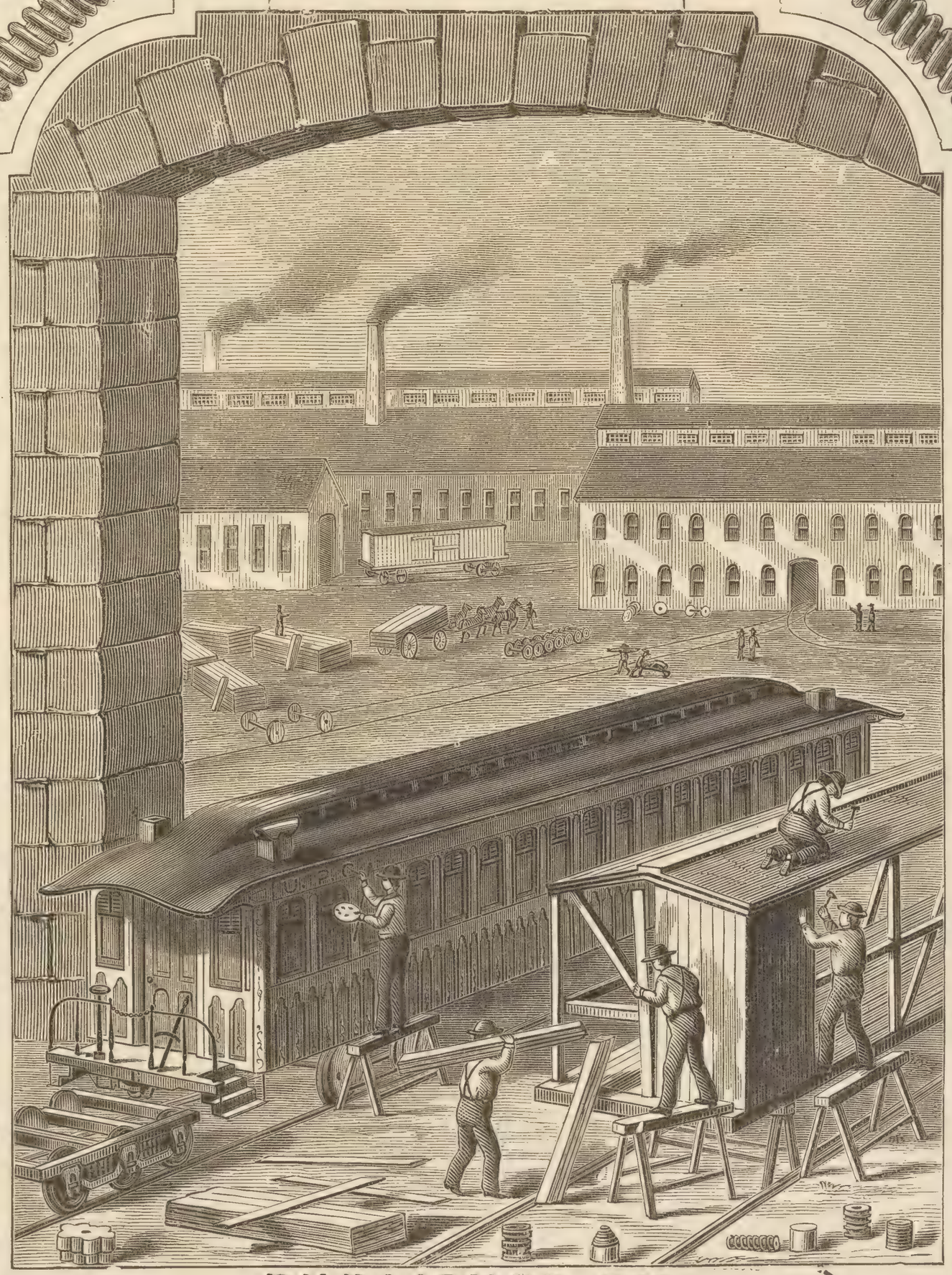
Vol. V. OCTOBER, 1874. No. 10



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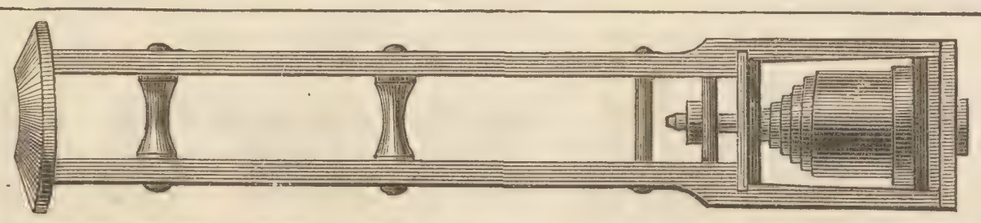

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Chilson's Patent Cone Disk Stove

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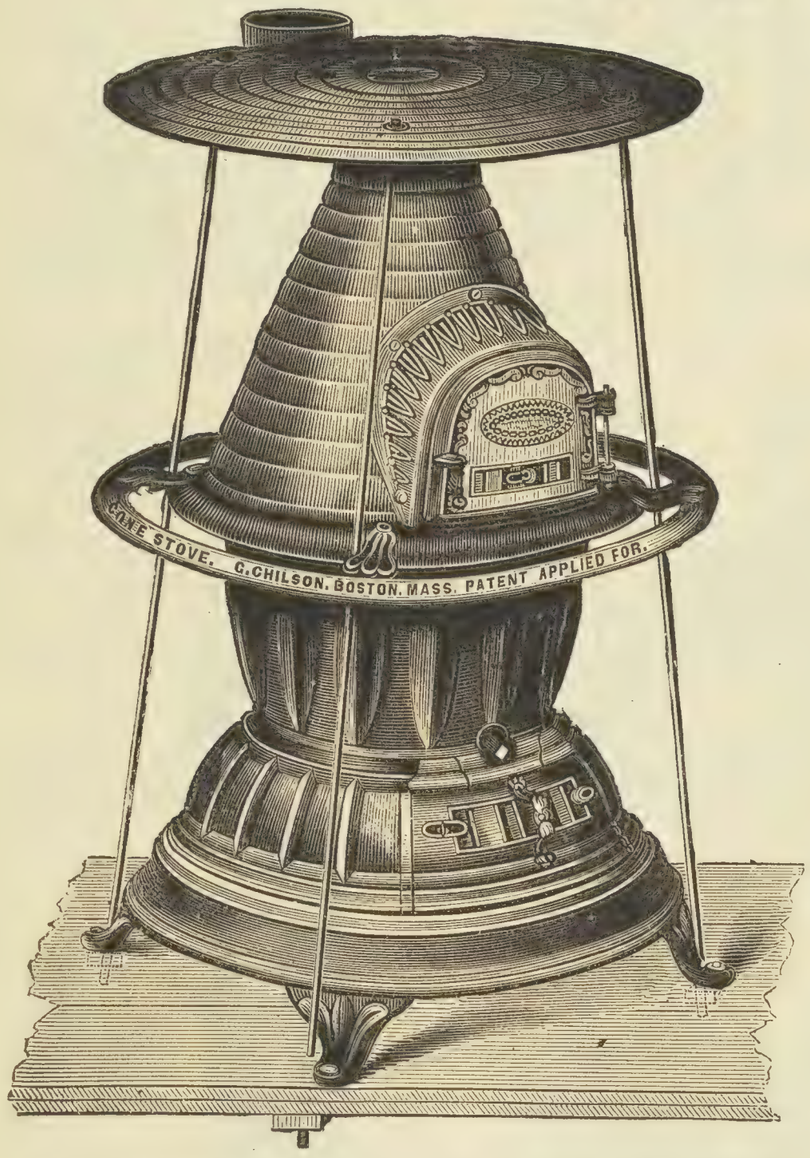

I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

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Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

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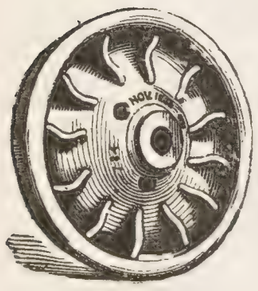

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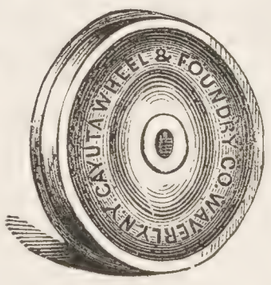

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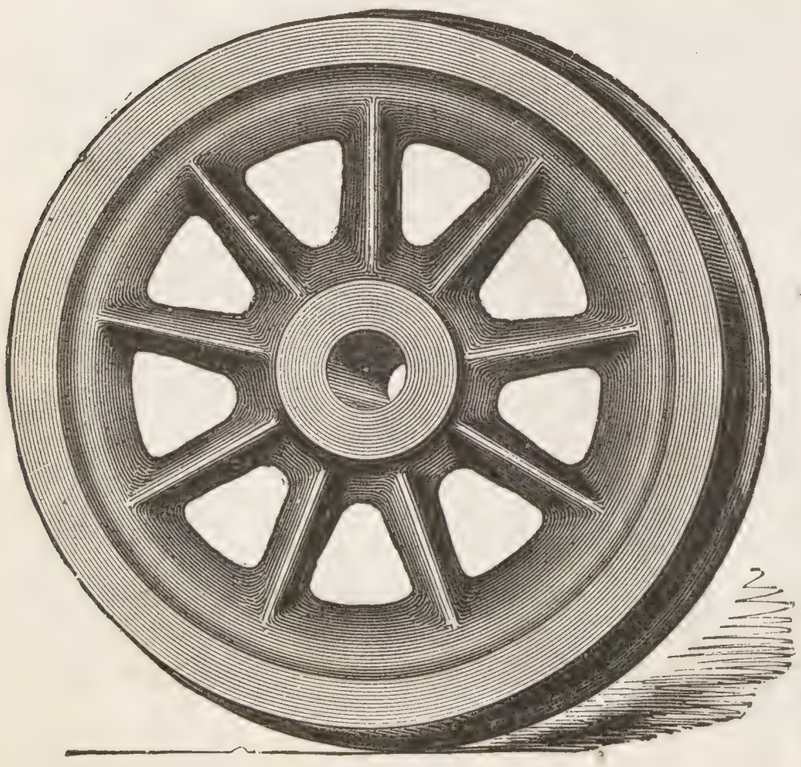

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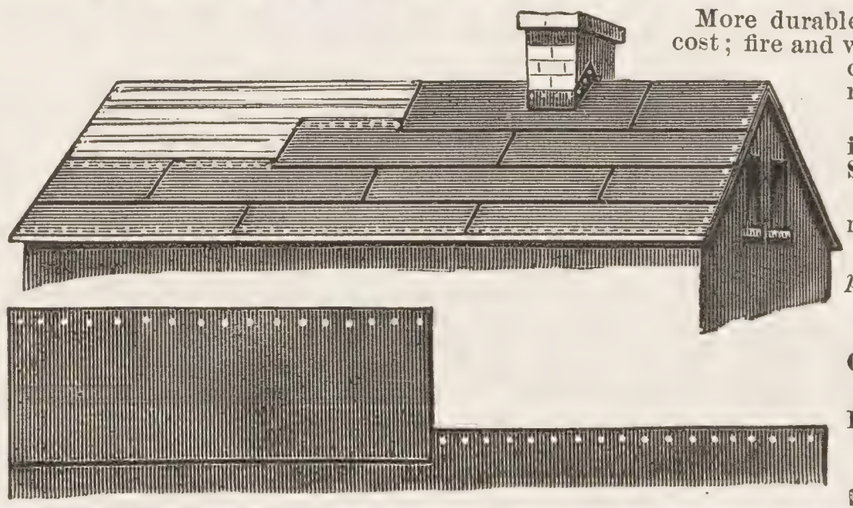

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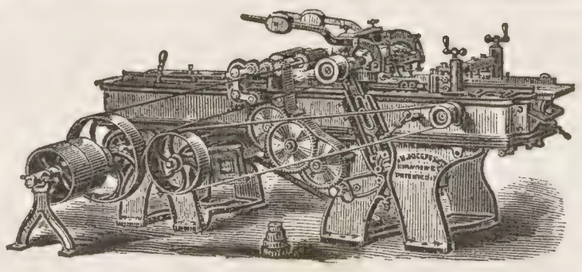

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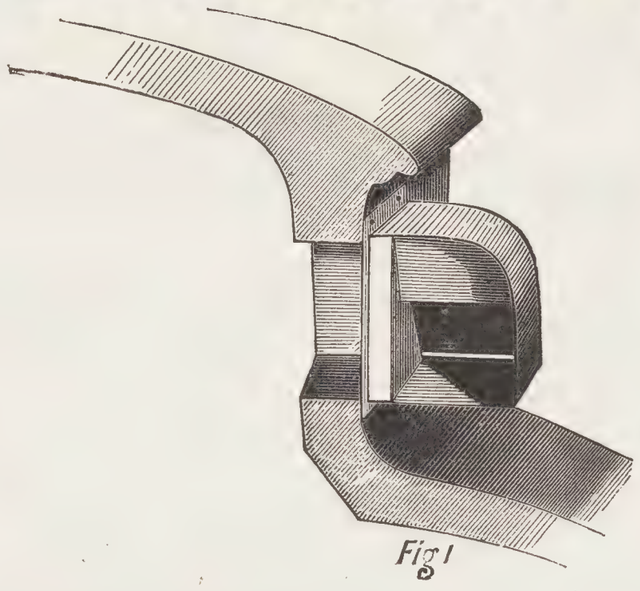

Fig 1

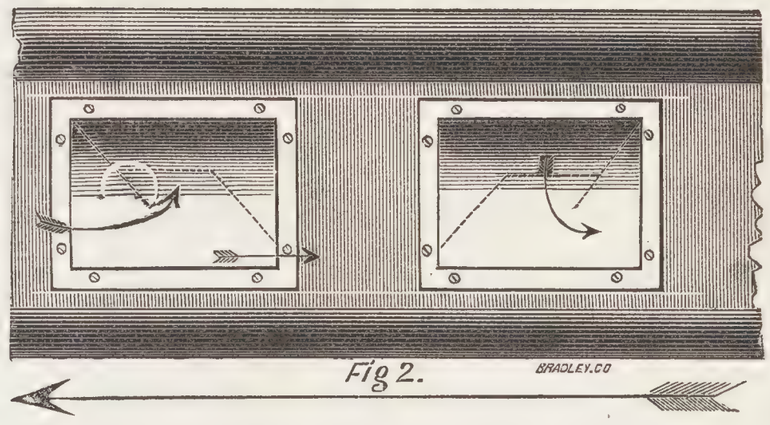

Fig 2. BRADLEY.CO

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

H. D. CARROLL & CO., Springfield, Mass.,

Proprietors and Manufacturers.

ROBERT HITCHCOCK, Inventor.

MILLER'S TRUSSED PLATFORMS. Compression Buffers and Automatic Couplers for Railroad Passenger Cars.

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Send for Illustrated Pamphlet, and call and see working models. **E. MILLER, Patentee.**

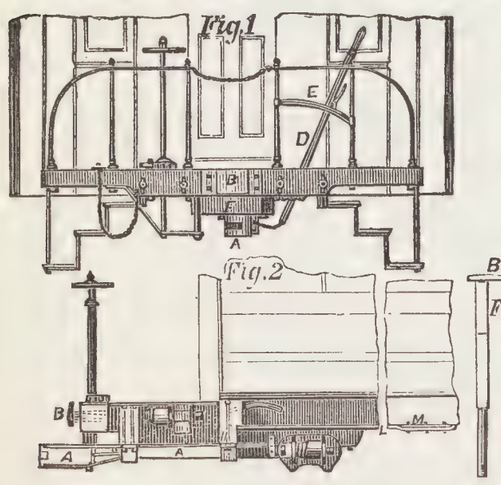

Fig.1

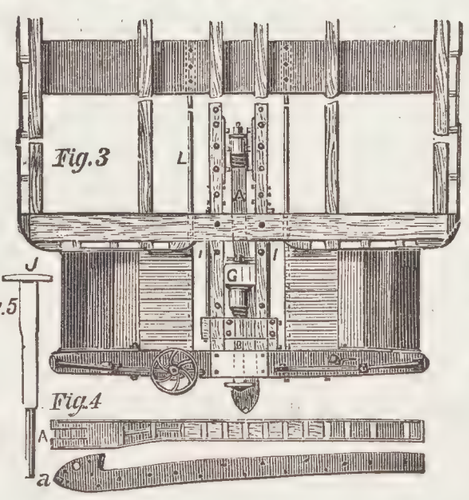

Fig.2

Fig.3

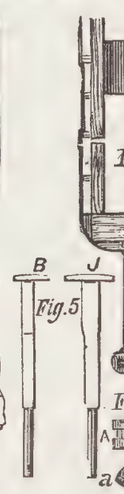

Fig.5

Fig.4

DESCRIPTION.

Figure 1 is an elevation; Figure 2, a longitudinal section; Figure 3, a plan of an end of a car to which the arrangement has been applied: and Figures 4 and 5 show top and side views of the "Hook" and "Buffer," drawn on a larger scale than that of Figures 1, 2, and 3.

The letters refer to the same parts in all the figures. A is the coupling "Hook," B the "Buffer," C the "Stop," D the "Lever," E the "Quadrant Ratchet," F the "Truss Beam," G the "Spring Beam," H the "Suspender Beam," I the "Upward Trusses," K the "Main Spring," L the "Downward Trusses," and M the "Bolster."

The Platforms, instead of being located below the centre line of the main sills of the cars, are placed *in* that line and held there by the Trusses I and L, so that the point of contact (in Buffers B) is *in* the said centre line and *not below* it.

The coupling "Hook' A is attached to the draw spring the same as the ordinary draw head, and at the same height above the track, but in such a manner that the outer end is free to move laterally for a short distance. The Coupling Hook projects beyond the platform. The Stop C is placed under the Buffer Beam to prevent accidental uncoupling. When two cars are brought together, the Coupling Hooks, from *their shape*, push each other aside, until the Buffers B are compressed hard on the Buffer Springs, then—*the points of the hooks having passed each other sufficiently far*—the Hooks are carried forward by their main-springs, and thus the "*Coupling*" and "*Compression*" are both effected automatically *and at the same time*, and without the use of links and pins. When two cars are thus coupled together, the *head* of the *Hook* of each car is under the Buffer Beam of its opposite car, and the platforms are close together, (about 4 inches apart.) The effect of this is, *one platform can not be forced over the other*, nor can a *child* fall between the platforms; the dust and rain are nearly all shut out; the "Compression" makes the train run steadily, and prevents all jerking at starting and stopping.

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Manufacturers of Sleeping, Saloon, Drawing-Room, Passenger, and Freight Cars of Every Gauge.

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Are now ready to receive orders for all kinds of

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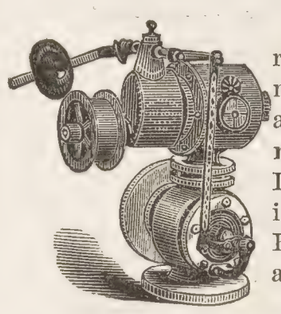

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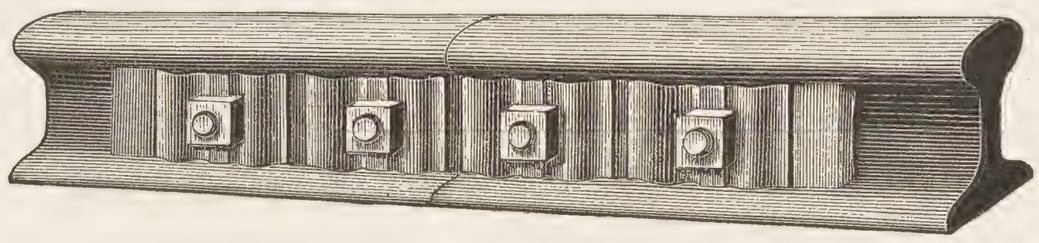

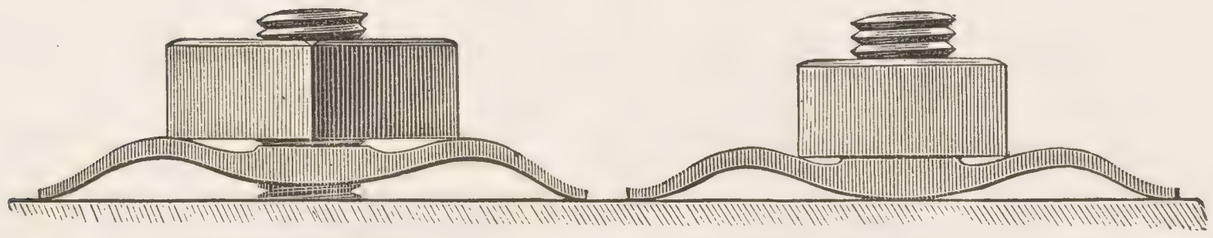

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For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.

The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

FOR RAILROADS, AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Packing certain quantities of mineral oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather, an element that is lacking in mineral oil. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and mineral oil together. In cold weather, the combination is not so essential, but it will always be found economical to combine a small quantity of the Liquid with the mineral oil which is generally used upon railroads.

Where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes, and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used. We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

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BOSTON, LOWELL AND NASHUA R. R. SUPERINTENDENT'S OFFICE,
P. NOYES, AGENT, BOSTON, April 13, 1874.

Dear Sir: We have been using your LIQUID PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq.,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent thickening; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Bell and Leather Stuffing Co., CHICAGO, Dec. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C. B. & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING same as purchased of you before, and send as soon as possible.
H. I. HIGGINS, *Purchasing Agent Quincy Railroad.*

CHICAGO, ILL., May 7, 1874.

AGENT BELT AND LEATHER STUFFING CO.:

Dear Sir: You will please forward to the C. B. and Q. R.R. ten barrels Liquid Packing.
H. I. HIGGINS, *Purchasing Agent C. B. and Q. R.R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.
J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq.: ALBANY, Nov. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report;

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.
JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

Send for a Barrel. No charge unless it does all we state.

Manufactured by the Belt and Leather Stuffing Co.,
47 INDIA STREET, BOSTON.

Sold by Vose, Dinsmore & Co., New-York.

RAWLINS' METALLIC PAINT.

Warranted Fire and Water Proof.

Will cover more surface and outwear any paint manufactured.

Owing to its extreme fineness, every particle is utilized. No sediment settles to the bottom, and when applied, it produces a smooth, glossy surface. With less oil to the pound, this paint will go over twice the space of other so-called "Mineral" paint, and produces a more intense color. It is entirely free from dirt, slate, or any impurities, being manufactured out of the best Red Hematite Iron Ore, and pulverized finer than any paint that has heretofore been manufactured by a process peculiar to this Company.

This paint is not affected by water or extremes of cold and heat, and is peculiarly adapted for tin roofs. It will also stand hard usage, and for railroad cars or wagons can not be excelled. It has been used by the Union Pacific Railroad Company, and by whom it is pronounced superior to any quality they have ever used.

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Rawlins' Metallic Paint Company,

RAWLINS, WYOMING.

ALBERT C. MCNAIRY, Pres't. JOHN COON, Sec. HARVEY T. CLAFLEN, Supt.
HENRY M. CLAFLEN, Vice-Pres't and Treas. SIMEON SHELDON, Engineer.

The Cleveland Bridge and Car Works,

[Established in 1851.]

THE McNAIRY & CLAFLEN MANUFACTURING COMPANY, Proprietors.

BUILDERS OF

RAILROAD AND HIGHWAY BRIDGES,

EITHER OF IRON OR WOOD.

Pneumatic and Screw-pile Sub-structures, Railroad Passenger and Freight Cars, Street Railroad Cars.

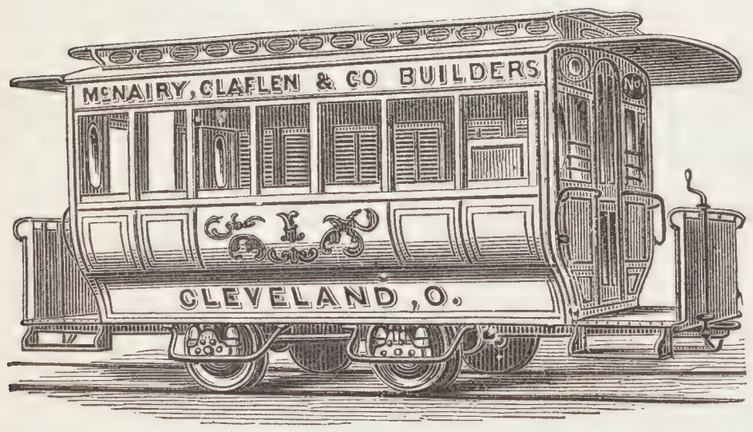
☞ Post's Patent Iron and Combination Bridges; Howe Truss Bridges, with Patent Iron Clamps; Street Railroad Cars, with Higley's Patent Running Gear and Brake.

Roofs, Turn-Tables, and Transfer-Tables

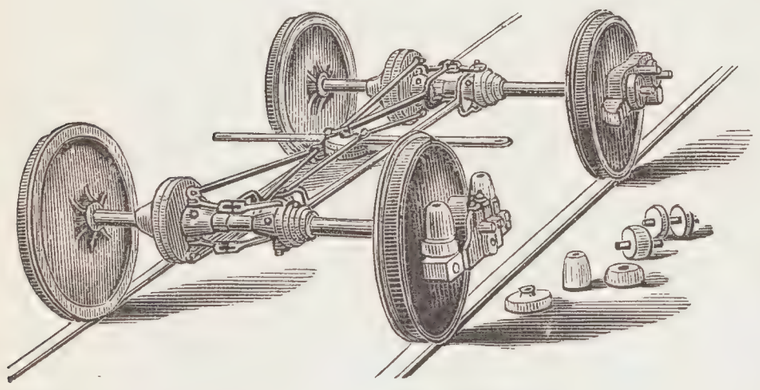
OFFICES—Waring Block, cor. Bank and St. Clair Streets.

WORKS—On Watson, Hamilton, and Lake Streets.

CLEVELAND, O.



The Lightest Running, Easiest Riding, Most Durable, and Most Economical Street Car in Use.



Higley's Patent Street Car Running-Gear and Brake.

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Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

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The K. P. R. R. CO.	L C. & L. R. R.
T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

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GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

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Manufacturers and Dealers in

COTTON DUCK,

For Car Covering and Car Seats,

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A full supply, all Widths and Colors, always in Stock.

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Make a ***Specialty of Freight Car Forgings*** and ***Castings*** delivered to Shops. Also ***Locomotive Cylinders, Frogs and Switches.*** Address,

THOS. N. MILLER, President.

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ARE NOW PREPARED TO RECEIVE ORDERS FOR ALL KINDS OF

FREIGHT CARS.

These works, recently completed, are furnished with the very latest and best Machinery, and are prepared to furnish the better qualities of work with promptness.

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No. 24 Columbia Street, New-York,

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Hydraulic Jacks and Punches,

BOILER TUBE EXPANDERS,

AND DIRECT-ACTING STEAM HAMMERS.

Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

WALL'S MAGIC RENOVATOR.

For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

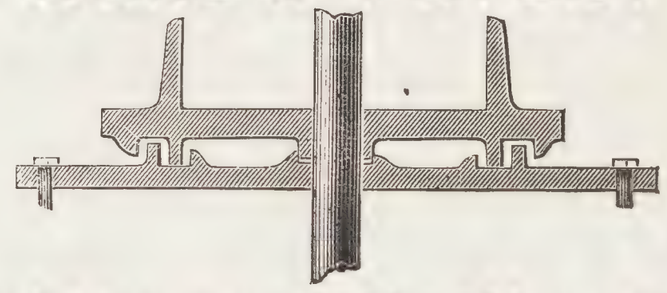
Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

JAMES J. WALL,

P. O. Box 45 Tremont, Westchester Co., N. Y.

WARD'S PATENT



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FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
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ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

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built in the most approved manner and of the best material. Orders respectfully solicited. Address,

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A. W. LOPER, Ass't Sup't St. Louis, Iron Mountain & S. R.R.
WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
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The "EMPIRE," a Fan-Blowing PORTABLE FORGE,

FOR SHOP USE.

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WITHOUT BELTS OR BELLOWS.

It is more **Easily Worked,** gives a **Better Blast,** and is the **Cheapest** forge made, and

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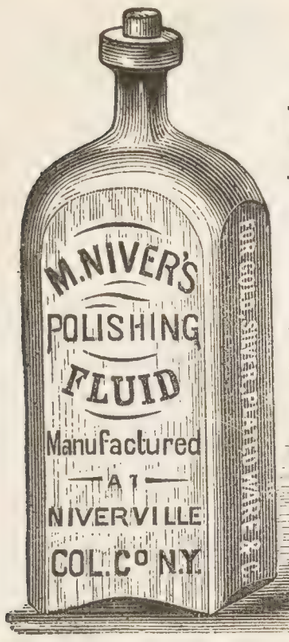
Also, Curry Combs, Boring Machines, and Cooley's Whip Racks, etc., etc.



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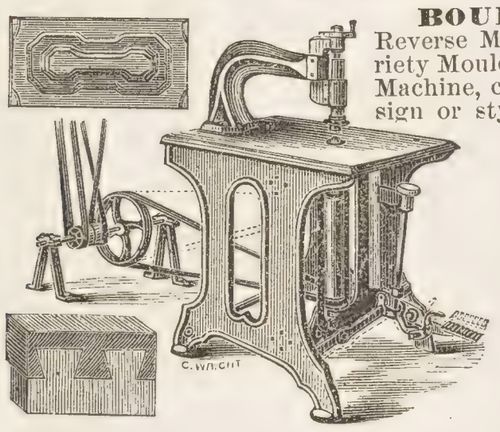

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Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

Routes and grooves for Windows, Stairs, Cars, Bridges, etc., etc.

Moulds, fine Bracket and general Scroll Work. It is a first-class Shaper and Moulder, Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.

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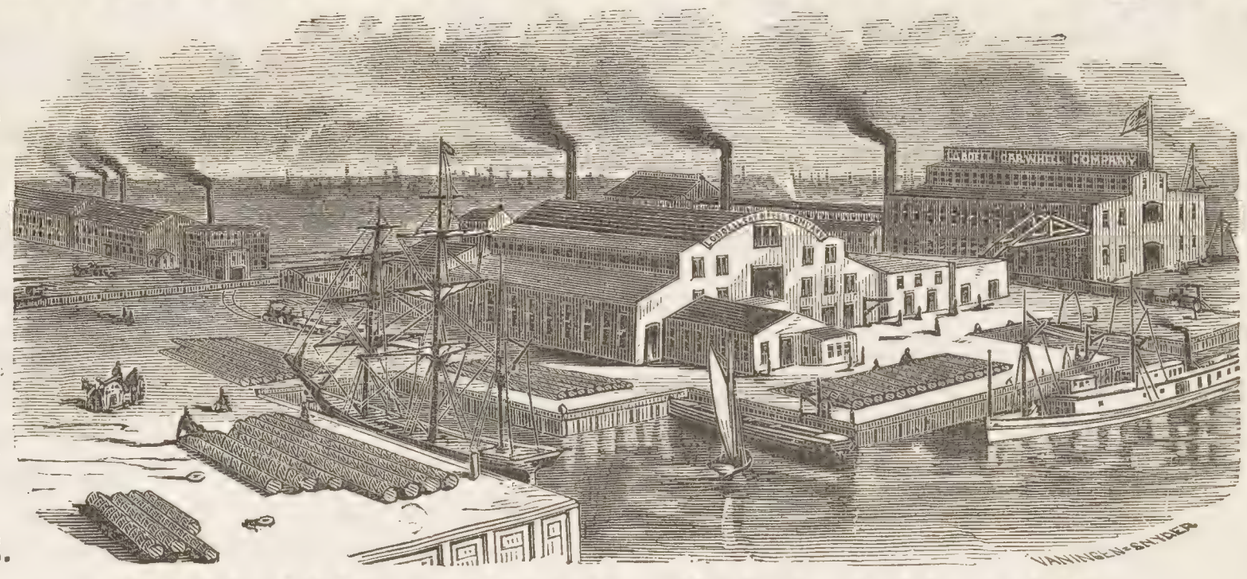
SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS FOR City and STEAM ROADS.



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WILMINGTON, DELAWARE.

GEO. G. LOBDELL, PRES'T. W. W. LOBDELL, SEC'Y. P. N. BRENNAN, TREAS.

THIS HAMMER

Awarded the First Premium of a Silver Medal

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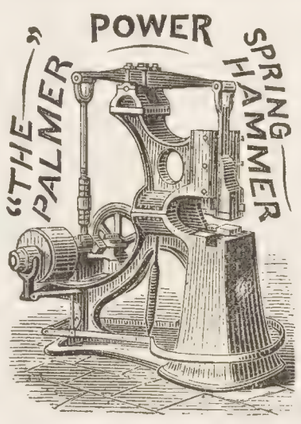

Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

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Who are also Builders of the

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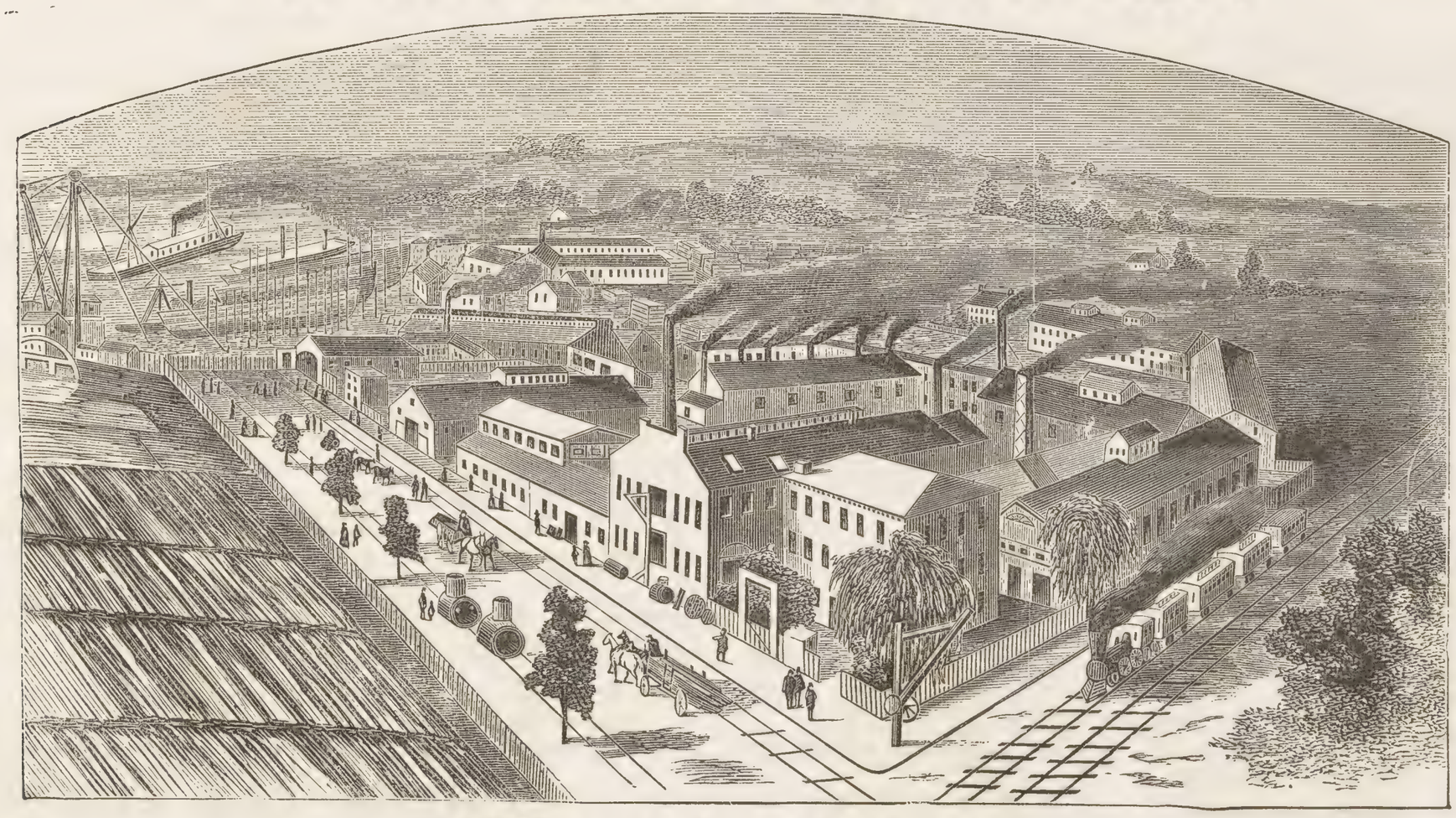

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FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

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SPECIAL ATTENTION PAID TO

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Outside Finishing,	$5.50	Engine,	$5.00
Outside Rubbing,	4.50	Coach-makers' Japan,	2.00
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These goods are now in use on the principal Railways of the country, and have had a success never before reached by any others. For Railway uses they are **Superior** to the imported.

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THE PULSOMETER,

APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

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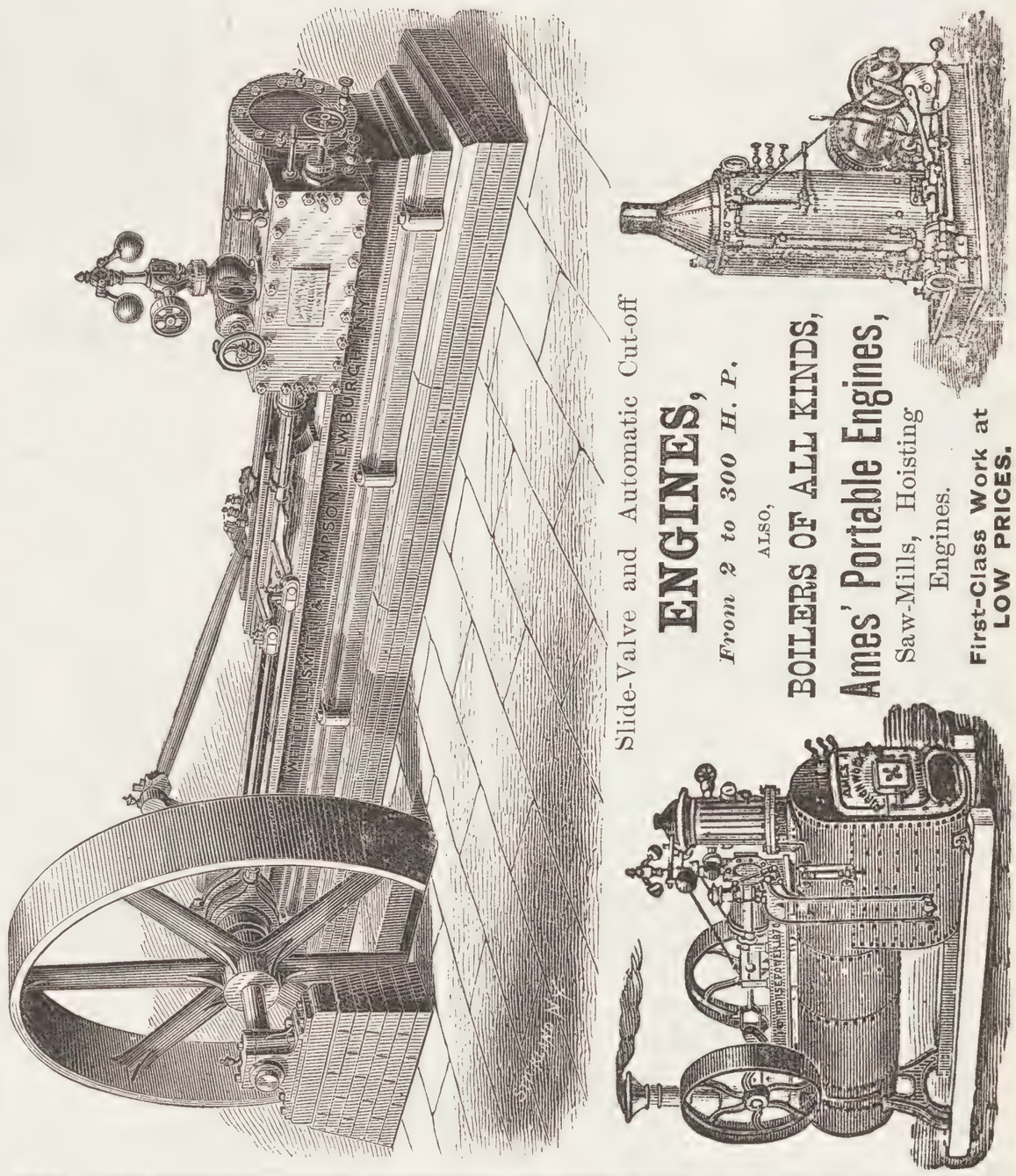

THE

Atlantic White Lead

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LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

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INDIANA CAR COMPANY,

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FREIGHT CARS,

(Capacity, Six Cars per day,)

JOHN McMILLAN, Manager. Cambridge City, Ind.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. V.
No. 10.

OCTOBER, 1874.

One Dollar per Annum.
Single Copies, 10 Cents.

An English View of Long Railway Runs.

It is a well-understood proposition, and one generally accepted as true, that nothing operates more effectually to increase the time spent in accomplishing a given journey by rail than working trains on the short-run system; and it is also true that so-called fast trains which stop frequently are the most expensive that it is possible to use. The reason for this last fact is obvious. Not only is much fuel wasted in doing work which is afterward undone by the brakes in a way which we have already fully explained when dealing with the rolling stock of the Metropolitan Railway, but the speed of the train when running must of necessity be very high in order that the train may, in any sense, fulfill the condition of being "fast." But high speeds represent a great consumption of fuel, and augmented wear and tear of engines, carriages, and road; and it will be found, as a result, that very few fast stopping-trains are run by railway companies who understand in what true economy consists. Trains which stop at many stations in close proximity are essentially slow, no attempt being made to travel at a high velocity between the stations; and those who require conveyance over long distances select trains the average velocity of which, measured by the mile, is not very high—continuous running without a break getting the train over the ground in excellent time. As an example of the latter class of train we may take the Scotch mail on the Great Northern. This train accomplishes the whole distance between London and Edinburgh—about 400 miles—in nine hours and thirty minutes, the average speed being about 42 miles an hour. It would be necessary to run this train at an enormously higher velocity if the stops were more numerous. As it is, we believe we are correct in stating that on no other line in the kingdom is a train to be found which gets over a greater distance in nine and a half hours. It is true that on the Great Western, trains are run which accomplish 200 miles in about four hours and twenty minutes; but a run of 400 miles is not made on any line, save the Great Northern, in much less than ten hours. Long runs require very good engines and excellent rolling stock; but these being given, long runs are decidedly conducive to economy, and there is no reason why they should not be more freely adopted than is now the case on many important lines, and on all such lines the principle apparently might be extended with advantage. For example, there is apparently no good reason why the run from London to Liverpool, *via* Runcorn, should not be accomplished without a stop, or at all events with but one stop, and in, say, four hours, the distance being, as nearly as may be, 200 miles. The road could not easily be made much better than it is, but the existing carriages would, for obvious reasons connected with the comfort of the public, not be suitable for such runs, and something in the nature of Pullman cars would be essential; at all events, free circulation through the train would be required. But this presents no difficulty. It is perhaps open to doubt whether a locomotive could be constructed which might be relied on to accomplish a journey of 200 miles in four hours without stopping, and the work would no doubt be exhausting to both driver and stoker. We have already expressed our opinions concerning the locomotives required for such work in a former impression, and we shall not further refer to the matter now, except to say that we believe it to be quite possible to construct engines which would be perfectly reliable, although they would, in some important matters of detail, differ from ordinary locomotives. The great difficulty to be contended with in working trains on such a long run as that under consideration, lies in providing water enough. This would not stand in the way of the London and Northwestern Company, who may use Ramsbottom's tanks, of which they have at present the monopoly. But it would be otherwise with the remaining English companies, who, precluded from using Ramsbottom's system, would be compelled to resort either to the use of tenders of unprecedented dimensions, or to some other device for filling up their tanks. There are grave objections to the use of large tenders, which would probably neutralize all the advantage to be gained from long continuous runs, but it is by no means certain that Ramsbottom's is the only arrangement by which a tender while in rapid motion can be replenished with water.

The idea of working trains between London and Liverpool direct resulted in nothing, although at one time it was stated, with some show of authority, that the directors were actually providing the requisite rolling stock, and on the Midland Railway trains no longer run without a stop to Leicester—a fact in some measure accounted for by the difficulty met with in providing water without the aid of the Ramsbottom trough. It may, from these circumstances, be argued that the long-run system is already fully developed; but this we dispute. We have very little doubt that, on the contrary, as great towns such as Liverpool increase in size, it will become almost essential to establish a railway service between them and the metropolis so rapid and so heavy that it can only be dealt with by trains running directly from city to city without a stop. If, for example, Liverpool can provide a sufficient number of passengers to London at any given hour in the twenty-four to fairly fill a train of, say, twelve coaches, it will be worth while to run that train through to London without a stop; and we feel certain that if such a through train, properly constructed, were put on to-morrow, making the run, say, 4½ hours, it would not only be the most popular train on the road, but also the train worked most economically. However opinions may differ in this country as to the value of the long-run system, it is certain that our friends in the United States are determined to give the system a fair trial. Since the 1st of June, the Pennsylvania Railroad Company have commenced working long-run trains between Pittsburg, Philadelphia, and New-York. The distance is 444 miles, and the train stops on the road but three times; at Altoona for five minutes, after a continuous run of 117 miles from Pittsburg; then comes a run of 132 miles to Harrisburg, where the train stops for twenty minutes for dinner; the next stage is to Philadelphia, 105 miles. The train stops here for five minutes, and then proceeds across New-Jersey for 90 miles to New-York. Nothing at all comparable to this work has ever before been done on a railway except once or twice by special trains under exceptional circumstances. The run of 132 miles is no doubt a wonderful feat, and redounds not a little to the credit of American engineers. The entire line, we may state, is laid with 60 lb. steel rails, laid on oak sleepers, and thoroughly well fished, the track being admirably ballasted. The train is made up of Pullman cars of the most luxurious description, and fitted throughout with the Westinghouse brake; the engines are supplied with water when running on Ramsbottom's system, and no pains appear to have been spared by the company to provide for the safety and comfort of the public.

As regards the velocity of this train, we learn from the published time-table that the train leaves Pittsburg at 7.25 A.M. and reaches New-York at 9.30 P.M. Deducting half an hour for stopping, we have as the total running time 14 hours 5 minutes, or say an average velocity of 31.7 miles an hour. Not a high speed certainly, but in no other part of the world is it easy, we believe, to accomplish a distance so great in the given number of hours. The first run of 117 miles is performed in four hours, or at the rate of 29.25 miles an hour; the next run of 132 miles is done in four hours, or at the rate of 33 miles an hour; the distance from Harrisburg to Philadelphia, 105 miles, is run in three hours fifteen minutes, or at the rate of, say, 32.3 miles per hour; the final 90 miles across New-Jersey being accomplished in two hours and fifty minutes, or about 32.1 miles an hour. We take it for granted that no great difficulty would be encountered in running the train at a higher speed, and performing the whole distance, say, in ten hours instead of fourteen, if it were worth while. As the facts stand, however, they prove that in America work is being done which deserves to be imitated in the old country, and its importance in a new and thinly populated country like the United States can not be over-estimated. We have no doubt that the possibility of running a locomotive continually and regularly for a distance of 132 miles will only give an additional stimulus to our American friends; and so, if we do not mind what we are about, we shall have some enterprising Yankee coming among us and bringing with him his own engines and cars, and running regularly from London to Liverpool in four hours, while we are debating whether it is possible to design an engine which can run for four hours without stopping and without a breakdown. Not the least remarkable feature in the working of the train to which we have re-

ferred is the circumstance that the engines make continuous runs of four hours without heating, or getting the tubes so choked up that they can not keep steam. We commend the facts to the attention of our railway men.—*Engineer.*

Phosphor-Bronze Axle-Bearings.

When two bodies are rubbed against each other (under equal pressure, and at equal velocity), the harder they are, the greater is the amount of heat generated; or on the other hand, the greater the difference of hardness between the two bodies rubbed against each other, the less is the heat produced. In the latter case, the harder body is more heated than the softer, if of equal size. If, for instance, glass is rubbed against cork, the heating is as 7 to 1 (the glass being heated seven times hotter than the cork); if copper is rubbed against cork, as 4 to 1.

The ideal of a bearing which would wear little would be one made of the same material as the axle revolving in it, if there had not to be taken into consideration the wearing of the axle itself and the heating. A bearing made of the softest material, in which an axle of the hardest material revolves, would be the ideal of a bearing which does not heat, and does not cut the axle, if the wear of the bearing, and deformation by pressure, etc., had not to be taken into consideration.

In practice the best medium must be found which

1. Does not cut the axle.

2. Wears (in itself) as little as possible, and consequently requires a minimum of lubrication.

3. Does not heat, even in case lubrication should be neglected.

4. Is capable of resisting any possible shock without changing its form or breaking.

Some railway companies desire to use few bearings, at the expense of many axles and much lubricant—(the consumption of lubricant is always in proportion to the wear of the axle on the bearings)—and therefore use bearings containing from 17 to 20 per cent of tin and 83 to 80 per cent of copper, which alloy, undoubtedly, is too hard, and must attack the axle, as has been shown on many railways. Other railway companies use alloys of lead with more or less antimony, which certainly do not attack the axles, but require much lubricant, and wear out very fast. A great number of railway companies in Germany take refuge in the so-called white-metal, which, if of proper composition, appears cheap, but in the long run certainly is the most expensive. The alloys of copper, antimony, and tin, or so called white-metal, are bad makeshifts, as well as the so-called lead-composition bearings of lead and antimony; for it is impossible to give these alloys a hardness approaching that of the revolving axle without rendering them brittle. If an alloy is used sufficiently hard to avoid great wear, these bearings will heat much and are very brittle.

On most of the English, Belgian, German, French, and particularly on American railroads, white-metal and, especially, lead composition-bearings are little used, and this with good reason; for what would become, for instance, of a white-metal bearing on an American railroad, where the bearings are subjected not only to heavy loads, but where they have to travel thousands of miles on rails belonging to other companies, and therefore are not much looked after?

Gun-metal bearings, alloys of tin and copper, are not often homogeneous, with the exception of the alloy of 17 to 18 per cent of copper, which is the most trustworthy alloy of tin and copper. In alloys containing a lower percentage of tin, the latter segregates in the form of tin spots, when the alloy cools slowly. All other compositions in use for bearings, such as 12 to 17 per cent of tin and 88 to 83 per cent of copper, do not make homogeneous bearings, unless they are cast in chill molds, which in practice is impossible. This heterogeneity of gun-metal bearings is dangerous, as it produces gripping, and thereby a rapid wear. This specific quality of gun-metal bearings (to grip) is theoretically easily explained: In cooling, the softer metal (composed of from 7 to 10 per cent of tin and 93 to 90 per cent of copper), being the less fusible, sets first, forming the skeleton of the bearing; later, the very hard and brittle alloy, containing 17 to 18 per cent of tin and 83 to 82 per cent of copper, sets and fills the pores of the softer skeleton. The particles of the harder alloy are easily torn away by the axle if the bearing is not sufficiently lubricated, and these tear the skeleton composed of the softer alloy; this I have frequently observed at rolling-mills where the bearings were not sufficiently lubricated, and where particles in the form of small flakes peel off.

A good bearing which answers all purposes must not be homogeneous, but must consist of a strong and tough skeleton, the hardness of which nearly equals that of the axle, in order to resist shocks without deformation, and the pores of this skeleton must be filled with the soft metal or alloy.

The nearer the hardness of the skeleton approaches the hardness of the axle, the better the bearing will resist the pressure or shocks; and the softer the metal filling the pores, the better the bearing is in every respect. Such bearings are now made by melting two or more alloys of different hardness and fusibility together, in such proportions that necessarily a separation into two alloys of definite composition takes place in cooling.

Phosphor-bronze bearings consist of a uniform skeleton of very tough phosphor-bronze, the hardness of which may be easily regulated to equal the hardness of the axle, while the pores are filled with a soft alloy of lead and tin.

Such a phosphor-bronze bearing may therefore be considered as having its wearing surface composed of a great number of small bearings of very soft metal encased in the tough and strong metal which equals the hardness of the axle; on the planed bearing-surface this molecular disposition can not be detected by the naked eye, but if examined with a magnifying-glass, the truth of the above will at once be seen. Another practical proof can be given by exposing such bearings to a dull red heat, when the soft alloy will sweat out, and the hard, spongy, skeleton-like mass remains.

In this consist the great advantages of phosphor-bronze bearings, which is proved wherever tested; for while the axle partly runs on a very soft metal, and thus obviates heating, even if not sufficiently lubricated, the harder part of the bearing, its skeleton, does not allow of wear taking place; and as the hardness is arranged to equal the hardness of the axle, wear is reduced to its very minimum.—*Dr. Charles Kunzel.*

Narrow-Gauge.

A correspondent of the Chicago *Evening Journal*, writing from Des Moines, Iowa, speaks in glowing terms of the advantages of narrow-gauge roads as compared with those of standard or broad-gauge. The writer says that the people of Des Moines are so sanguine of the ultimate growth of a great system of narrow-gauge roads in the country, that they have formed a company with a capital of $3,000,000 for the construction of a road of this description from Bismarck, Dakota, on the Northern Pacific Road, to St. Louis *via* Sioux City and Des Moines. A narrow-gauge road extending 160 miles north-westerly from the latter place was projected some time ago, and 30 miles of it are already built, as the writer says, with Iowa money and by Iowa men. Its progress is represented as having been slow but sure, and its success so great that new rolling-stock has been required nearly every week since it has been opened. Four trains are run daily, and the business already pays more than the expenses, which are very considerable, as depots, side-tracks, round-houses, etc., have to be constructed. That the road will do as much carriage with greater profit than a broad-gauge road, is shown by the following estimate made by the writer, and based upon 16 broad-gauge cars weighing 8½ tons each, and 20 narrow-gauge cars weighing less than 3 tons each:

	Paying Load.	Dead Weight.	Total Weight.
Broad-gauge	160	136	296
Narrow-gauge	160	60	220
Saving in weight (tons)			.76

This estimate is the same as that contained in the report of the Denver and Rio Grande road, made last year, and if subject to no modifications or drawbacks, is certainly very conclusive as to the economy of narrow gauge freight traffic. It amounts substantially to this: That while an 8½-ton standard-gauge car carries only 10 tons of freight, a 3-ton narrow-gauge car will carry 8 tons. Now suppose we reverse this proposition, or look at it from an opposite point of view, by comparing a 3 ton narrow-gauge car with a freight capacity of 3.53 tons—relatively the same as 8½ to 10—with an 8½-ton standard-gauge car with a freight capacity of 22.66 tons—relatively the same as 3 to 8. The result (omitting fractions) will then be as follows:

	Paying Load.	Dead Weight.
Broad-gauge	362	136
Narrow-gauge	70	60
Difference	292	76

—or, in other words, this way of putting it shows a narrow-gauge saving of 76 tons of dead weight to compensate for a loss of 292 tons of paying freight; for what is to prevent the standard-gauge car from carrying the same *relative* quantity of freight as the narrow-gauge car? to say nothing of the advantages of shorter trains; or, if the cars are of the same width—of less overhang? not to mention other considerations touching floor area, height of cars, the inequalities of track as affecting four and eight-wheel cars, the traversing of curves, etc., all of which would seem to favor the broad-gauge theory in an economical point of view.

Railroad Train Timer.

An ingenious invention for recording the motion of railway-cars has recently been successfully tested on the Vandalia line, between Terre Haute and Indianapolis. There is a locked iron box on one side of the car, which contains a common clock. A spiral thread is fastened upon one of the axles of the car, which turns a wheel over the axle. This communicates its motion to a set of rods, which in turn move another small wheel under the edge of the car, and it again turns a small rod which projects upward into the iron box before mentioned, and moves a pencil-point slowly back and forth across a long and narrow sheet of paper, wound upon a small drum, the drum being turned at a constant rate of progression by the clock-work. The paper is ruled in red lines into very small sections, every fourth line the short way being a dotted line, representing a mile. Now, as the pencil is moved slowly across the paper by the rods, their motion being governed by the rate of the axle, and as the paper is slowly moved forward by the clock-work at a uniform rate, the pencil-point makes a diagonal line across the paper back and forth. If the car goes a mile in four minutes, the line will cross just four sections diagonally from one dotted line to the next one. If it goes a mile in two minutes, the line will pass forward more rapidly, crossing only two sections diagonally. And thus the rate of the car, and consequently the rate of the train, is recorded by the pencil-point on the paper. If the train stops, the line crosses the paper directly and not diagonally, and the time in minutes it stops is shown by the number of sections crossed in that manner. The names of the stations along the road are written at the proper places on the paper. Thus the exact rate made at any point on the line can be found afterward. If the train stops, it can be told how long it stopped, and where. If the wheels are locked and allowed to drag, it can be told how far they dragged, and where.

All fraudulent or reckless rates of progression can be unerringly detected, and if the train is run faster or slower than is allowed, the "bosses" are sure to know it.

A New Train Signal.

Mr. J. C. McMullin, General Superintendent of the Chicago and Alton Railroad, has invented a new signal-lamp for the tail of trains, which is intended to indicate approximately to the following train the distance between them. The Chicago *Tribune* describes it as follows:

"The new signal is composed of two lamps, connected by a galvanized iron tube about three feet long, and three inches in diameter. One of the lamps has a red bull's-eye lens, and the other a white one. The light is placed in one of the lamps only, and is conveyed from the burner through a tube upon a reflector on the other lamp, where it is deflected and made to show out through the lens the same as though the burner were directly behind the lens, thereby producing, burning one burner, two lights with uniform brilliancy, that will blend regularly together whether burning high or low. The lamp is placed upon the top of the caboose on a raised platform that is made to revolve so as to show a light in either direction.

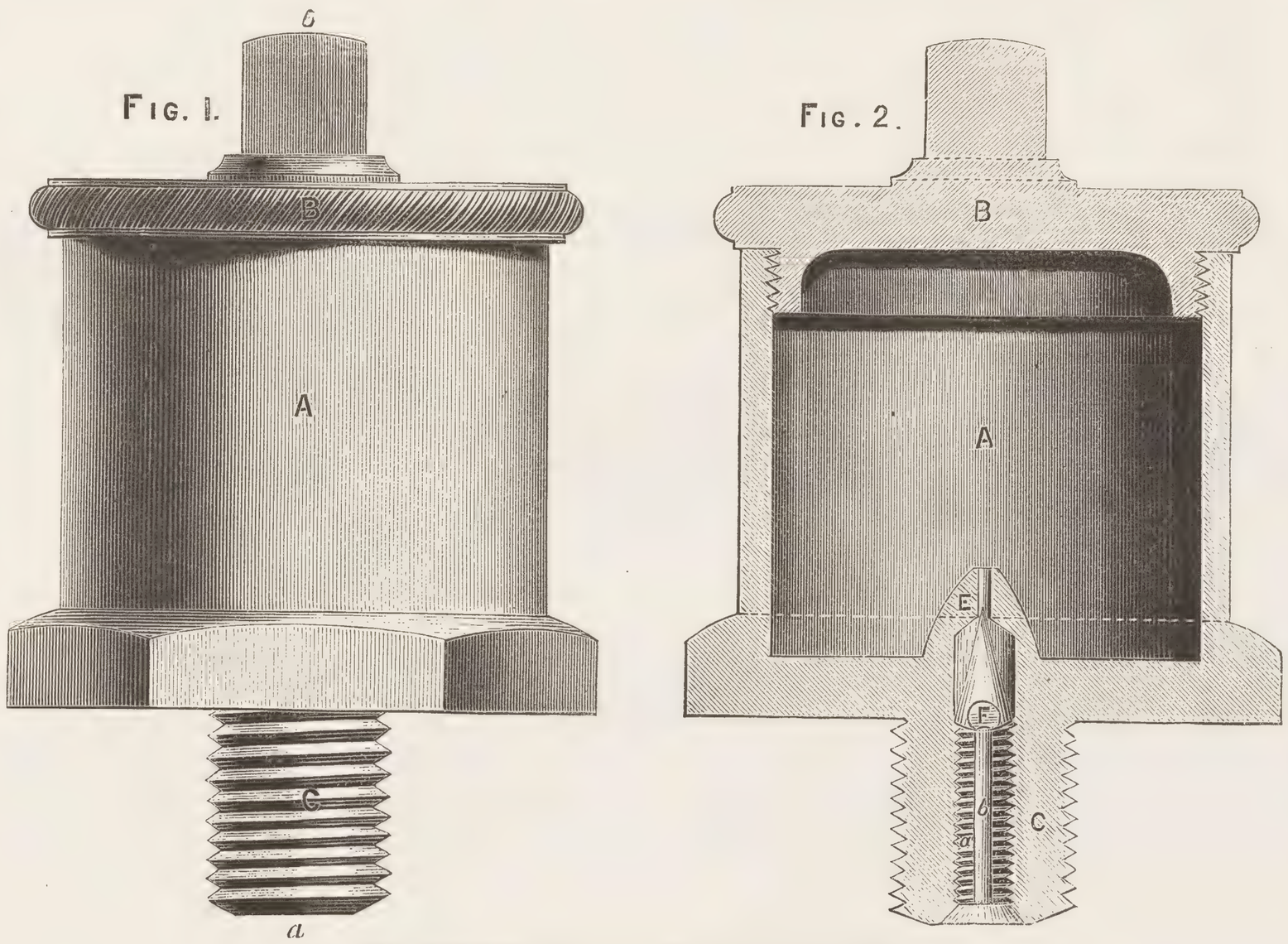
"At a distance of one inch and upward, the white and red lights blend together and show but one strong red light, which in a clear atmosphere can be seen from four to six miles. If within seven eighths of a mile of the train, the red and white lights are partly blended together. If within three fourths of a mile, the red and white lights are three inches apart; at one half-mile, 12 inches; at one quarter-mile, 20 inches; and at a distance of 100 feet, the lights are 40 inches apart. The different conditions of the atmosphere do not interfere with the relative spaces between the two lights. If, for example, it is so foggy that the lights can not be seen more than one quarter of a mile, the moment they are seen they will appear 20 inches apart, at once warning the engineer that he is within a quarter of a mile of the preceding train, and he must use every means possible to stop his train and prevent a collision."

An exchange, in speaking of the comparative advantages of iron and wooden coal-cars on the Cumberland and Pennsylvania Railroad, says that an iron car made of boiler-iron, with a capacity of ten and a half tons, weighs but 10,000 lbs., while the wooden car of like capacity will weigh 17,500 lbs.—a difference so great that while 29 loaded iron cars make up a train, 20 wooden cars make up one of equal weight. The iron cars stand the wear and tear of usage better than the wooden, come out of the wreck battered and bent, but readily straightened out as well as new, where wooden ones would be shivered to pieces and burnt, and the bolts and bars carried away in a basket. And moreover, there is about $100 in favor of the iron car over the wooden, when their first cost is considered. The Consolidation Coal Company have iron cars now in use which have been on the road sixteen years and over.

The American Railway Improvement Company's Oil-Cup.

It is well known to mechanics that the action of journals or crank-pins inclosed between boxes, causes more or less suction, owing to the partial vacuum produced by the rotary motion, the amount of suction depending on the size of the journal or pin, and also upon the velocity of their movement. The oil-cup which we illustrate, is so designed as to make this suction available in feeding the oil, the supply of which to the journal is controlled and regulated by means of an adjustable plug inserted in the shank of the cup. The quantity of oil necessary for proper lubrication is just so much as is required to keep a paste-like coating on the journal; if more than this is supplied, it tends to wash off such coating and produce friction. The device represented in the engravings supplies just what is requisite and no more, acts continuously while the machinery is in motion, and ceases to feed when it stops.

Fig. 1 is an outside view, and Fig. 2 a vertical section showing the construction. A is the oil-chamber



IMPROVED OIL-CUP FOR MACHINERY.

surmounted by a cap B, with a milled edge and squared projection for using a wrench when necessary. C is a screw-stem or shank by which the cup is held in position, and in this stem is a hole for receiving the plug *a*, the hole having a diminished diameter from the point E to the entrance of the oil-chamber. The plug *a* is a cylindrical piece of metal or other material neatly fitting the shank hole, and with its upper end tapered. This tapered end enters the oil-passage as shown, and can be made to abut against, or recede from, the shoulder at E by the use of a screw-driver. The oil or other lubricating liquid passes from the chamber by a grooved passage *b* in the plug which is intersected by a cross-groove at F.

In operating the cup, the cap or cover should be first removed and the chamber filled with oil before the stem or shank is screwed to its place on the machinery, the plug *a* having been previously adjusted against the shoulder E, so as to prevent the escape of oil. After the filling, the cap is screwed on tightly and the plug slacked off from the shoulder a quarter turn. The cup is then in working order and will not require further adjustment, the feed being automatic and regulated by the suction. A difference of temperature, nor oils of a different density, does not affect its working. It can be filled without altering the feed, is not liable to get out of order, can be easily repaired if accidentally broken, saves all unnecessary waste of oil, is simple in construction, cheap and durable. Orders should be addressed to The American Railway Improvement Company, Harrisburg, Pa., who are the sole owners and manufacturers.

The True Course for Employees.

The true question for an employee is not how much he can get forthwith, but how he can keep steadily employed. The men who get rich are not usually the strikers who refuse to work for particular wages. Strikers are apt to waste in idleness, in the course of a year or two, time wherein they could have earned more than the amount for which they strike. Those who increase their income are the men who accustom themselves to regular industry, who keep steadily at work for such compensation as they can get, live within their means, save money and invest it. Thus they keep up a good income, and increase it from year to year; quite as fast, in most cases, as they become able to manage it with judgment. The employee who takes the most pains to find out exactly what service his employer wants, to render that service carefully and generously, and who, having mastered the details of his work, does not leave it to go into some other employment where a larger but uncertain compensation is promised, is the man who is morally certain to rise. When hard times come, or when his employer is unfortunate and is compelled to retrench, he is the man who will not be dismissed, and will not lose time in seeking work, when he would, of necessity, be eating up his savings till he finds it. When vacancies occur in the establishment, he is the one who will be intrusted with the most valuable work, which commands the highest pay. When his employer wants a partner, he is the man likely to be chosen. When others are discharged for incompetency, he will be retained; for his knowledge of the work and his known reliability make for him a good position in which he is sure to be able to do well. True, this way of life is not always easy; it requires self-control, conscience, and steadfastness; but it is the way to self-respect, honorable standing, legitimate wealth, and happiness.—*Mercantile Journal.*

The Marietta and Cincinnati Railway car-repair shops, at Zaleski, Ohio, were burned on the 9th instant, with about 25 cars, involving a loss of $75,000.

The Chicago, Rock Island, and Pacific Railroad is keeping an extra set of books for the business of their Iowa lines, with a view to lay them before the Legislature of that State, to demonstrate the workings of the law by actual experience figures.

The New-York Central and Hudson River Railway Company is now building at the foot of Sixtieth street, on the Hudson River, in this city, a grain-elevator, capable of holding from 1,000,000 to 1,200,000 bushels of grain. This elevator will be used principally for storage purposes for the grain brought on in the company's cars, and intended for transferment to sea-going vessels and canal-boats.

The Deterioration of Engine and Car-Axles, and its Causes.

BY J. M. BLANCHARD.

THAT the axles of railroad cars when made of the best fibrous iron, commence to deteriorate as soon as their use commences, and that the effect is to crystallize them and thus tend to destroy their strength and reliability, is now an admitted fact, however diverse the opinion of writers upon this subject may have been in times past. So fully is this recognized, that some of the best managed roads in the country are in the habit of keeping an account of the dates at which new axles are placed under passenger-cars, and as nearly as possible, of the number of miles that such cars are run, and of removing such axles when they have performed all the service that can safely be required of them. In the treatment of this subject, an endeavor will be made to point out the principal causes of deterioration, and then to suggest how such causes can to some extent be removed.

From the moment that an engine or car commences to move upon the rails, its axles are subjected to three active elements of deterioration, the first of which is rotation, independent of the load that may be resting upon them, or of other extraneous circumstances. It is a fact, not very generally known perhaps, that the simple rotative movement of an axle or shaft tends to crystallize it, and that if such movement is continued for a sufficient length of time, it will become unfit for further use. While fully believing in the truth of this statement, I should have hesitated to urge it here as one of the elements of destruction to railroad axles, were it not that the fact has been demonstrated by the French Academy of Sciences, in the following manner, namely, by taking a bar of the best iron, and turning it to an even diameter throughout its entire length, and then placing it in suitable bearings, and by means of a pulley placed thereon causing it to be rotated for a period of time, when its strength was tested, and it was found to be less than was shown by a similar test made before the experiment began. After the first test was made, the rotative movement of the shaft was continued, and another test was made, and its strength was still further reduced, and so on until several tests had been made, each subsequent one showing that the strength of the bar had been reduced, and that just in proportion to such reduction crystallization had taken place. Sustained by such proof as the above, I do not hesitate to say that the simple rotative movement of car-axles constitutes one element of their deterioration, and while admitting that it may be the least active of any, yet it is believed to be of sufficient importance to justify its being named as one of the three principal ones.

The second of these elements in the order in which I have chosen to name them, beginning with the least important, is the vibration or bending action, by passing through frogs, around curves, and by the oscillating movement of the cars upon the track. It must be apparent to all who have given a moment's thought to the subject, that every time an engine or car oscillates from one side of the track to the other, to such an extent as to bring the flanges of its wheels in contact with the rails, the tendency is to bend the axles, and that this is constantly recurring, happening hundreds of times during each mile run, and that its intensity is always in proportion to the deviations from a straight line in the rails, the speed at which the train is moving, the weight of the load upon the wheels, and their diameters. When the train is moving at a great velocity, and is entering upon a curve, the tendency to bend the axles is greater than at any other time, and it has often been a matter of surprise to the writer that at such times the axles were not bent to such an extent as to cause a fracture. Another point at which the axles are severely tried is in passing frogs, where the car is sometimes moved laterally a full inch or more, and with such suddenness as would seem sufficient to break the strongest wheels and axles. The causes of vibrations above referred to are sufficient to cause the fibres of the metal of which the axles are made, to be deflected from a straight line, or in other words, to cause the axles to be bent to such an extent and with such frequency as to keep the molecules of the iron in motion, and thus cause them to assume the form of crystals, in which form they have far less cohesive power than when in the form of fibre. Any one desirous of testing the truth of this theory can at any time do so by procuring a rod of fibrous iron, of such diameter that he can easily bend it, and placing it upon some solid substance and pressing the ends downward, and then turning it over and bending it in the opposite direction, he will soon have the pleasure of seeing the rod separate at the point where it was bent. If the experimenter is an observing person in search of knowledge, he will perceive that he has done something more than to bend and break a rod of iron; for it is a fact that he will have changed to a great extent the character thereof, at its centre, while its ends remain the same as before; for the fractured parts will show him that in breaking it, he transformed a portion from tough fibrous to crystalline and brittle iron.

The third and most prolific element of deterioration in the use of axles is the blows which they receive in passing over the rails. As wheels and axles are at present constructed and united, the vibrations caused by a blow upon either are transferred to the other, and hence as the wheels and axles derive but little advantage from the springs which are above them, the blows which are given to the wheels in passing rail-joints, through frogs, and around curves, are virtually so many blows given to the axles.

In speaking of the crystallization of iron, Mr. Hood, an eminent writer, in a paper read before the Institute of Civil Engineers, of London, England, says, "In the manufacture of some descriptions of hammered iron, the bar is first rolled into shape, and then one half the length of the bar is heated in a furnace, and immediately taken to the tilt-hammer and hammered, and the other end of the bar is then heated and hammered in the same manner. In order to avoid any unevenness in the bar, or any difference in its color where the two distinct operations have terminated, the workman frequently gives the bar a few blows with the hammer upon the part which he first operated upon. That part of the bar immediately becomes crystallized, and so extremely brittle that it will break to pieces by merely throwing it on the ground, though all the rest of the bar will exhibit the best and toughest quality imaginable. This change, therefore, has been produced by percussion (as the primary agent), when the bar is at a lower temperature than the welding heat. Here it must be observed that it is not the excess of hammering which produces this effect, but the absence of a sufficient degree of heat at the time the hammering takes place; and the evil may probably be all produced by four or five blows of the hammer, if the bar happens to be of small size."

And Mr. William Fairbairn also, in speaking on the same subject, says, "Undoubtedly in almost all cases of the sudden fracture of axles or wrought-iron bars during employment, the fracture presents a crystalline structure; but we believe that any molecular disturbance, such as impact, can effect this by breaking the fibre into a number of prisms, each of which when carefully examined has the appearance of a crystal, the only question being how long will the material sustain the action before it breaks."

These facts, when added to the experience of railroad men, will, I think, be sufficient to show that the "hammering," as Mr. Hood states it, or the "impact," as Mr. Fairbairn terms it, of axles while in use, is the most active element of deterioration to which they are subjected, and in view thereof we cease to wonder that engine and car-axles break, but our wonder is that they endure as long as they do, and that some more effective means for preventing this "hammering" or "impact" is not adopted.

Thus far we have merely pointed out the three principal elements of deterioration in car-axles, and proved that such a change as is referred to does actually take place. In doing this, little has been said with which the observant operator is not familiar; but the facts can not be too often urged upon the attention of railroad men; for however familiar they may be with such facts, they are very slow in applying the remedies, if any exist. It is apparent that the first of the elements here spoken of as tending to lessen the strength of axles, in so far as it acts independently of the others, is one for which there is not any remedy; for the axle must rotate, in doing which it will to some extent be crystallized and consequently weakened. The second element is one which is capable of being only partially remedied, because the tendencies to bending can only be partially removed, and this partial remedy can best be applied by using proper rail-joints, and frogs, by proper alignment of the track, and by taking care that the distance between the flanges of the wheels is such as not to leave too much lateral motion on the rails, or to cause them to bind between the same. The third and last element in this case is the one which is the most serious in its consequences, but fortunately it is the one for which a remedy is most applicable. It is a fact that in the construction of railroads, and of wheels to run upon them, solidity, firmness, and an unyielding material have been the leading features; and with this no one would be disposed to find fault if these characteristics were applied at the proper points only; but experience has shown that they have been applied to at least two points where flexibility should have been provided for, namely, at the joints of the rails, and at some point between the axle and that portion of the wheel which rests upon the rail. As I have given my views as to what a rail-joint should be, they will not be reiterated here; but as the subject of the prevention of the blows and shocks which perform such a prominent part in the deterioration of axles is of paramount importance, a few suggestions as to the method of preventing them will be ventured.

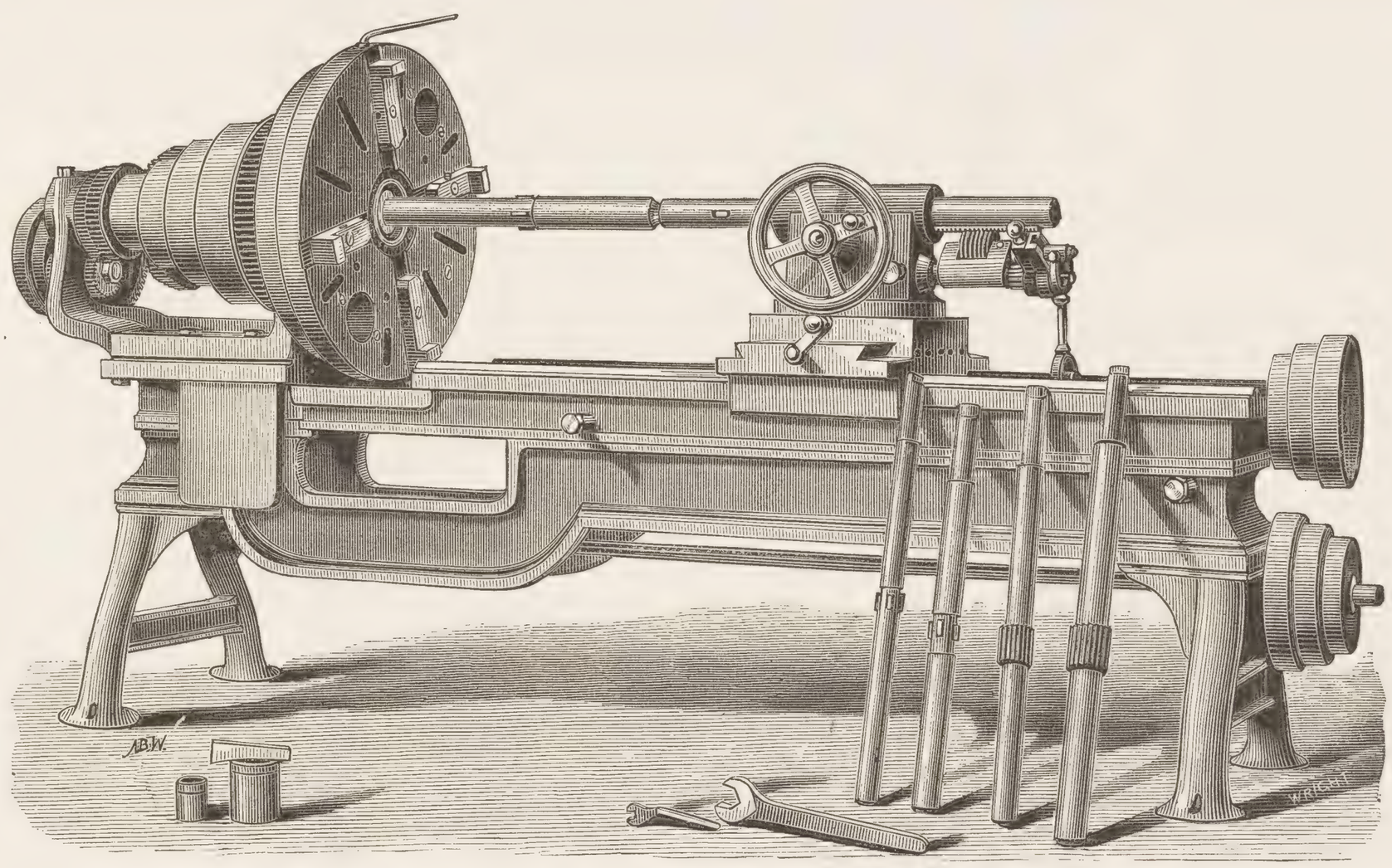
It must be apparent to the most casual observer, that so long as the present mode of constructing wheels is adhered to, the destructive action consequent upon their rigid character will be continued, and their axles will at all times be liable to be broken while in use; and for this there is no remedy but to make some form of an elastic or yielding wheel, the elastic portions of which shall receive and break the force of the blow given to its periphery, and thus prevent it from being transferred to the axle. This plan, it is believed, would be virtually to provide springs for the axles to rest upon, and it is at least presumable that the benefit to them would be as great as it is to the other parts of the engine or car. It would be doing an injustice to others, were I to permit it to appear that this idea was now advanced for the first time, as it is true that it has been previously acted upon by others to some extent; but it is equally true that it has never received at the hands of railroad men more than a tithe of the consideration which its importance demands. In looking for a practical illustration of the effect of the blows which car-axles receive when in use, I can find no better one than that suggested by the sledge of the smith in forging iron; in which case the effect sought to be produced is the yielding of the iron; and in order that this may be effectually performed, the instrument used is a heavy, unyielding piece of steel or iron, which is applied to the mass to be operated upon with all the force that the stalwart smith is capable of imparting to it. It may pertinently be asked, What would be said by railroad men if a smith that had been employed by them to repair rails, should approach them and ask that he be provided with sledges and hammers made in sections or parts, with diaphragms of rubber or other elastic material between such parts? The most ready and truthful response to such a request would be that such sledges and hammers will defeat the very object that you seek to accomplish, or at least they will prolong the operation through a much greater period of time than is required by the tools with which you

are already provided; and this would be said because the official thus answering would have impressed upon his mind the fact that the object to be accomplished in such a case would be to change the form of the material upon which the blows were received. Such a response would clearly indicate intelligence in the official, and would show that in respect to the necessities of such a case, he was superior to his subordinate; but this superiority would consist in the fact that he was able to appreciate another fact, namely, that the result to be accomplished was not to save the hammer from deterioration, but to change the form of the metal as rapidly as possible. Let us suppose that this official, after having finished his colloquy with his smith, leaves him and seeks his master of machinery, and enters into conversation with him upon the causes of deterioration in axles and rails, and this gentleman says to him that the cause is in a great part owing to the fact that the sledge or hammer with which the blows are given to your rails is too rigid and unyielding; your wheels, which in this case are the hammers, should be made in sections, and have between such sections diaphragms of rubber or other elastic substance, in order that the form of the hammer may be changed and not that of the rail or mass upon which the hammer strikes. To this argument the official would reply by his acts if not with words, Oh! no, I have just discussed this *elastic* question with my smith, who is repairing rails, and I proved to him and to all advocates for yielding devices, that such things are not only not necessary, but that they are positively injurious. To which the master of machinery, if an intelligent man, would probably very modestly reply, Your argument with the smith was very philosophical and true; but it should be borne in mind that between the two cases there is the greatest possible difference, because, in the first case, the object is to change the form of the mass which receives the blows, at whatever cost to the hammer; and in the other, it is to prevent change in the mass, and in the material of which the hammer is made, even at the expense of increased cost in such hammer.

THE Supreme Court of Wisconsin has granted the injunction asked for by the Attorney-General and Railroad Commissioners of that State, to compel a compliance with the provisions of the Potter law by the Chicago and Northwestern and the Milwaukee and St. Paul Railroad Companies, the first of October being the time specified when such compliance will be exacted. Hitherto, the companies have ignored the act, but now no alternative remains but to adjust their charges for freight and passengers in conformity with its requirements. They will not, however, continue to furnish the present first-class accommodations, but will be compelled to retrench and economize in every direction. Fewer trains will be run and slower time made. First-class coaches will be withdrawn and second-class substituted. Work in the shops and on the road will cease, and the number of employees will be reduced to the minimum.

Improved Chucking and Turning-Lathe.

THIS machine is in several particulars an improvement upon the ordinary lathes used in railway machine-shops. It is arranged to chuck in the usual way and to bore with boring arbors or bars. It has what is termed a gap-bed for pulleys of large diameter. When the gap is closed, as shown in the engraving, the lathe has a swing of 27½ inches; when it is open (by sliding back the movable bed-plate), a pulley will swing 48 inches in diameter and with an 18-inch face. The tail-stock has a compound sliding movement and can be adjusted to bore any taper required. The head-spindle is hollow, and has a universal ball-bearing to receive end of boring-bars 3½ inches in diameter. The tail-spindle has an automatic feed with a traverse of 14 inches, and at its forward end an adjustable ball-and-socket shank for receiving arbors or bars. The machine is geared fourteen to one into face-plate, to which are attached regular chuck-jaws, and will bore or chuck a hole 20 inches in diameter. By means of an improved 18-inch face-slide turning-rest (not shown in the cut), it will turn a pulley from 8 to 30 inches in diameter. The



IMPROVED CHUCKING AND TURNING-LATHE.

improved features are the ball-bearing in head-spindle, the gap in bed-plate, the adjustable tail-stock and automatic feed, by which holes of greater taper may be bored and larger pulleys swing upon the lathe. The machine is compound and indexed, the wrought-iron case-hardened, and the work all scraped. It also has steel wrenches, and patent hollow, self-oiling countershaft. Manufactured by the New-York Steam-Engine Company; office, 98 Chambers street.

THE New-Haven, (Ct.) Car Company is finishing three palace-cars for the European and North-American railway. They cost $11,000 or $12,000 each.

ASTRONOMICAL calculations relating to the planets and the nearer fixed stars are as reliable as any other process in mathematics; but when it comes to the "Milky Way," certainty is somewhat blended with conjecture. It is estimated, however, from the best attainable data, that this nebulous streak in the heavens consists of some eighteen millions of suns, many of which are of inconceivably greater dimensions than our own, and each of which has doubtless its own retinue of planets. And these solar systems, though to the eye they appear crowded together in an obscure and hazy mass, may be as remote from each other as they are from us. Such are the marvels of celestial science.

Panama Railroad.

THE length of this line from the Atlantic to the Pacific Ocean is nearly 48 miles; the summit ridge is 287 feet above the mean tide of the Atlantic. The distance from New-York to Hong-Kong *via* Cape Horn is more than 17,000 miles, but by this railroad across the Isthmus it is less than 12,000, a saving of 5500 miles. To the Pacific coast of America the opening of this railroad in January, 1855, was as a light in the dark. In the last twelvemonth 152,000 tons of freight were carried over the line. It is now proposed to furnish it with steel rails. Starting from Aspinwall (otherwise called Colon), on the Atlantic side, for Panama, on the Pacific, the traveler is soon in the midst of a scene of tropical beauty hardly to be surpassed in the world. Cocoa, palms, and bread-fruit trees wave their branches on either side, and from the fastnesses of murky swamps richly colored aquatic plants rise in luxuriant wildness. The cries of gorgeously-plumaged birds are heard on all sides, and now and then the discordant notes of monkeys, parrots, and other natives of the woods. On the low muddy banks of streams yellower than the Tiber can be seen the huge unwieldy forms of alligators sunning themselves and awaiting some unlucky object of prey. Almost all the towering trees are clasped in the vice-like embrace of plants of parasitic growth, and many tottering trunks attest the effect of close companionship. Along the sides of the road and upon the woody banks of the streams passed over are to be seen the thatched habitations of the mongrel specimens of humanity that live on the Isthmus. The rainy season commences in May and lasts until October, and it rains "hot water," according to the statement of the residents. The wires of the Isthmus Telegraph Company run alongside the tracks. The dampness of the earth is guarded against by setting the telegraph-poles in concrete; the railroad-ties are made of lignum-vitæ, laid on a stone ballast. The telegraph-poles cost $5 each, and the railroad-ties $1.50 and $2 each. Enterprise along the line manifests itself occasionally in clearings, and a better style of dwellings. Mr. William Thompson, who for many years was a conductor on the Panama Railroad, has leased 70 acres of land from the company for a term of 35 years. Upon this clearing he proposes to plant 35,000 india-rubber trees, and furnish a marketable article therefrom. The rubber-trees are brought from Darien by negroes and Indians, and are from two to three feet in height when planted. In four years' time the trees will have attained full growth. The trees are tapped in the same way as maple trees at a "sugaring," the rubber-juice being caught in a basin dug in the earth and lined with lime. From 12 to 30 lbs. of rubber are obtained from a tree at a tapping, the market price of which, on the Isthmus, is from $22 to $35 per 100 lbs. The road and rolling-stock cost about $12,000,000.

GET into office if you wish to know how many friends you have. Get into trouble if you wish to know how many you have not.

Car-Ventilation.—Reply to Judge Maine.

EDITOR OF THE NATIONAL CAR-BUILDER:

SIR: In our late report to the Master Car-Builders' Association, as chairman of the committee on heating, ventilating, and lighting cars, we had occasion to refer briefly, and in moderate terms, to the various devices proposed for ventilating cars. While we had no expectation of entirely satisfying any one of the numerous authors of these devices, we intended to treat all fairly, and by showing what was required, as based upon scientific inquiry, rather than upon popular notions, many of which have been long since exploded, we hoped to perform a service for all, and make the way to success easier, rather than more difficult.

We are assailed in your August issue by Mr. S. Colver Maine, as greatly wanting in discrimination because we could not see in his device all that he sees. He even places us below ordinary school-boys in point of intelligence. Now, since we do not lay claim to any very great knowledge on a subject which, at best, is but imperfectly understood by those who have devoted a lifetime to it, and is admitted to be one of the most difficult, therefore we are not above criticism. Every intelligent discussion of the principles underlying the subject of ventilation will be welcome. Nevertheless, when, as in this case, any one becoming inflated with conceit begins to accuse us of school-boy stupidity, and if we must accept the position of school-boys, to which he has assigned us, and whose business it is to live and learn, we will first endeavor to puncture any bubbles that stand in the way of our doing so.

Our critic condescendingly forgives the committee for any lack of knowledge on the subject of ventilation, but we can not return the compliment. Let him who has taken the sword perish by the sword, if he stands condemned by his own utterances. His defense of his plan is much worse than the plan itself. And here let us state that the committee did not notice his plan in their report "without any examination or effort on their part to correctly understand its working," but, on the contrary, his own explanations were patiently listened to, and an examination of the operation of his device carefully made by members of the committee, and they have seen no reason to change the opinions then formed. So far as we could, in the short paragraph of our report devoted to him, we gave him credit for some improvement on the old plan, but did not think his device would fill the programme fully, and by this opinion we stand to-day.

Now for his own explanations of his plan as set forth in his criticism of our report. He would have us believe, as we understand him, that "the air thus freed from dirt is admitted through 32 ventilators in the immediate vicinity of the mouths and noses of the passengers, where it is most needed," then being *deflected* and rising to the top, without coming in contact with persons at all, or benefiting their mouths and noses (?), carrying up, also, the contiguous air with it, and when once at the top, by some hocus pocus or magical power unknown to science, it has the faculty for expelling all the organic and morbific matter that happens to be present, and at the same time "taking on all the lost heat of the car, and then descending, still taking on the rising heat, it reaches the floor, or the point where it will be attracted by the rising columns of air, etc." What becomes of it finally, he leaves us to imagine. Now, if our critic expects any body to believe all this, we fear he will be disappointed. It reminds us of the famous hunter who chased a lot of bears and wolves for a long time around a hay-stack, and finally hit upon the plan of bending his rifle in a curve, so that, with a single shot, he not only killed all the bears and wolves he had been chasing, but also brought down a deer which happened to be passing at the time.

Had Judge Maine possessed a knowledge of the first principles of ventilation, he would have known that the only practical method of getting rid of the effects of organic and morbific matters in the air, is to expel the air in which they are carried, *heat and all*, or else to dilute the impure air with a fresh supply of pure air, as any poison may be rendered innocuous when sufficiently diluted. Chemical means may also be employed under some conditions, but to suppose that fresh air may become mixed with impure air, and absorb its heat without becoming itself contaminated, and "its chemical freshness and purity be preserved," is too severe a tax on our credulity. We are referring now to what our critic claims for his device, not what actually takes place. We do not desire to follow him further, although his absurdities are numerous and flagrant, but we hope and trust that whenever he undertakes to attack us again, he will be able to exhibit more logical consistency, if not a better knowledge of the schools.

W. E. CHAMBERLAIN,
Chairman of Committee.

Safety-Shoe for Cars.

THE Portland *Press* describes a trial of Messrs. Emery & Doyen's patent safety-shoe for railway-cars in that city lately at the Rochester depot. The invention consists primarily in the application to the under surface of the truck of two parallel shoes or runners, with the ends turned up at an angle; through the bottom of the shoes the wheels project to bear upon the rails, and each shoe is made of greater width than the thickness of the wheel, and is formed with a flange upon each edge, with a space between the wheel and the flange a little more than the width of the rail. When the wheels from any cause slip off, the shoes drop down on the rails and support the cars, and are prevented from leaving the rails by the flange, while owing to their broad bearing surface on the rails, sleepers, or ground, the friction instantly acts as a safe and powerful brake, retard and stop the motion of the cars without the application of the train-brakes. Yet there is no dead stop while the momentum or power is greater than the friction. The first test was to load the car to which the patent is attached with railroad iron, and let it run at a good rate of speed over an open switch. The car came to the switch under good headway; and when the wheels left the track, the shoe struck the next rail, and the car stopped. Two similar tests were made. The fourth and last test was to run the car at a fast rate of speed over the track with a rail out. The test was satisfactory, the car passing on without any injury. No one expected that the patent could possibly have such control over a car under such circumstances. Colonel Wildes and John F. Anderson, Esq., of the Railroad Commissioners, were present, also a large number of railroad men in the city, and the universal opinion was, that the patent did all that the owners claimed it would do.

A Narrow-Gauge Sleeping-Car.

THE Jackson & Sharp Company, of Wilmington, Del., have recently completed and shipped to the Utah Western Railroad, two narrow-gauge cars. One is a combined baggage and smoking-car, and the other a passenger-car with sleeping compartments. The former is similar in its general plan to the same class of cars used on roads of ordinary gauge, and will comfortably seat twenty-three persons. The latter has some new features of construction worthy of special note. It is the first narrow-gauge parlor and sleeping-car ever built, and although designed for the private use of the president of the railroad company, it is also adapted for general passenger use, one half of it being furnished in the ordinary way with seats, which are of the Bunting patent, with nickel-plated arms, the top and backs being covered with crimson and green plush. In every respect the whole apartment conforms to the interior of the best passenger-cars. There is seating capacity in the apartment for 23 persons. At the other end of the car is the President's saloon, which is carpeted with tapestry of a very handsome design, and on either side are sofas and revolving-chairs covered in maroon leather, which will seat 10 persons very comfortably. Besides these are a half-dozen camp-stools, room for two of which has been made on the platform which has folding steps and iron gates. Adjoining this apartment is a private state-room, sufficient for two persons, with card-table, etc. Opposite is a stove, wash-stand, ice-cooler, looking-glass, etc. All these apartments are finished with every convenience of the Pullman sleeper, and yet there is ample room for all purposes. The dimensions of the car are 35 by 8 feet, it weighs 16,000 pounds, and will accommodate 43 persons. The interior is finished in walnut, with panels of bird's-eye maple and ash, the trimmings being silver-mounted. The car is well lighted with large windows, which lower in the old stage-coach fashion, has high ceilings and ample ventilation, and is provided with six very pretty oil-lamps. The ceiling is artistically painted in lively and pleasing colors. The outside of the cars is painted in canary, with green stripings. They have the Miller coupler, and the Jackson & Sharp truck.

The interior arrangement of the passenger-car was modeled by Mr. John W. Young, the president of the road, and a son of Brigham Young; but the original design of both cars is that of the Jackson & Sharp Co. pattern, which has undergone no alterations since the construction of the first narrow-gauge car, so thorough and complete was it.

The above description is from the Wilmington *Daily Commercial.*

The Pullman Car Abroad.

COL. THOMAS W. KNOX, the journalist, who has been traveling in Europe for a year past, writes from Berlin, on the 10th of August, as follows:

"For the last three weeks I have been knocking around with Col. Gourand in a Pullman car, which you are doubtless aware was taken to the continent two or three months ago. The car has been from Liverpool by the way of London and Ostend to Paris, Mont Cenis Tunnel, Turin, Florence, Rome, Naples, Bologna, Venice, Sommering Pass, Vienna, and Berlin, and since coming here it has made two trips to Potsdam and one to Frankfort-on-the-Main. It starts to-night for St. Petersburg, by the way of Bromberg, Kœnigsberg, and Vilna, stopping a couple of days at the frontier to adapt the trucks to the Russian gauge. When it reaches St. Petersburg, it will have traveled 7000 kilometers from Ostend. So far there has not been the slightest accident, not even a hot box. The car attracts as much attention as a menagerie in a country town, and has been visited by thousands of people including grand-dukes, princes, railway officials, and all sorts of 'swells' generally. All have expressed the greatest admiration, and several important contracts are under negotiation in addition to those already concluded and announced."

Learn to Forge your own Tools.

MANY mechanics have an idea that after they have mastered the more legitimate duties of the work-shop, they have learned all that is necessary, and can undertake any thing in their line of business. Machinists particularly are prone to this error—a common one, by the way—and think a knowledge of fitting and turning, once acquired, makes up for all other deficiencies. In reality, the self-styled finished mechanic is, paradoxically, the unfinished one; for he who acknowledges his shortcomings, and tries to correct them by obtaining all the information he can, will acquire a more thorough knowledge of his profession. Comparatively few machinists are competent to dress their own tools, or, indeed, handle the blacksmith's hammer on any work. How many times such knowledge would have been invaluable, we leave individuals to decide from their own experience. A simple weld, which they were unable to make, a faculty for dressing chisels without endan-

gering their eyes by striking the anvil instead of the tool, would assuredly have stood persons ignorant of such details in good service in time of need. Apprentices who go to the tool-dresser to have the edges of their chisels or other instruments renewed, will do well to observe the process and inform themselves of it instead of throwing coal at the helpers, or otherwise conducting themselves in an unruly manner. Observation and experience are twins, and no youth, nor, indeed, any adult, can hope to attain proficiency without paying attention to details as well as other matters.—*Exchange.*

Transferring Prints and Leaf-Forms to Wood.

To transfer pictures to sycamore or white pine, you must first plane your wood perfectly smooth, and give a few coats of French polish; then take your picture, and damp it with a sponge soaked in spirits of wine; place the picture on the wood, and then place a piece of thickish cloth over the picture; then get a warm iron and rub gently over the cloth, being careful not to shift the picture. You must keep rubbing the iron backward and forward for ten or fifteen minutes; then take off your cloth and leave it for some hours. Then you must get some cold water and damp your finger in it and rub the paper. Great care must be taken in this, or you will disturb the impression. Keep damping your finger as you go on. When you have got it all off, you can polish over. Any kind of picture will do with the exception of glazed ones. Ink pictures take off best. There is another method by which the effect of white leaves prettily grouped on a dark, softly-graduated ground is produced. The leaf or pattern is fastened temporarily to the wood, which must, of course, be nice and smooth, fit for varnishing. Then take a brush of stiffish bristles filled with some pigment. Bend back the bristles toward you, and away from your pattern; then let go suddenly. Some of the pigment will then be precipitated on the wood where not covered by the pattern. You proceed in this way till your judgment tells you the pattern is well defined, taking care to vignette or allow the shading thus produced to fade away toward the edges. You may advantageously practice with a blacking-brush, using blacking thinned down with gum-water for the pigment on a sheet of paper, using a fern leaf or two for patterns.—*Furniture Gazette.*

THE Baltimore Bridge Company a few days since received a contract to build two iron bridges for the Lima and Huacho Railroad, of Peru. Each bridge will consist of two spans, each span sixty feet in length. In all, the Baltimore Bridge Company have constructed thirty-one bridges for different corporations in South-America, one of them being more than 500 feet in length, and at one point 252 feet in height.

Method of Attaching Check-Chains to Cars of the Boston and Albany Railroad.

THE engravings are copied from drawings furnished by Mr. F. D. Adams, the master car-builder of the above-named road, to the committee on Check-Chains, and referred to in their report made to the Cincinnati Convention in June last. The method of attachment is so clearly shown in the cuts as to require but little explanation. Fig. 1 is an end view of truck and floor-timbers of the car-body. Fig. 2 is a plan of the truck-timbers with chains attached. The peculiarity of Mr. Adams's plan consists in attaching the upper ends of the chains to the two platform sticks or the timbers to which the draw-bar is attached, instead of the outside sills, as is usually the practice. For this purpose he uses a plate of iron $\frac{3}{4}$ of an inch in thickness and three inches wide, with hooks *b b* at each end. This is bolted to the under-side of the draw-timbers as shown, at a point about 6 inches forward of the truck, so that the chains when in position will hang clear of the truck end. The dotted lines in Fig. 1 show the position of the chains when the truck has deviated from the line of the track, as indicated by the dotted lines in Fig 2. The main purpose of check-chains being to keep the truck from getting crosswise the rails when the wheels are off the track, this would seem to be a very good arrangement—much better, at all events, than many in use, or rather on exhibition. It is claimed by Mr. Adams that this plan secures an unusually strong attachment, and is very simple in its application. A chain from the corner of the truck to the centre-timbers of the car, affords a more direct line of resistance when the truck is off the rails, than if it extended from the corner of the truck to the sill

Fig. 1.

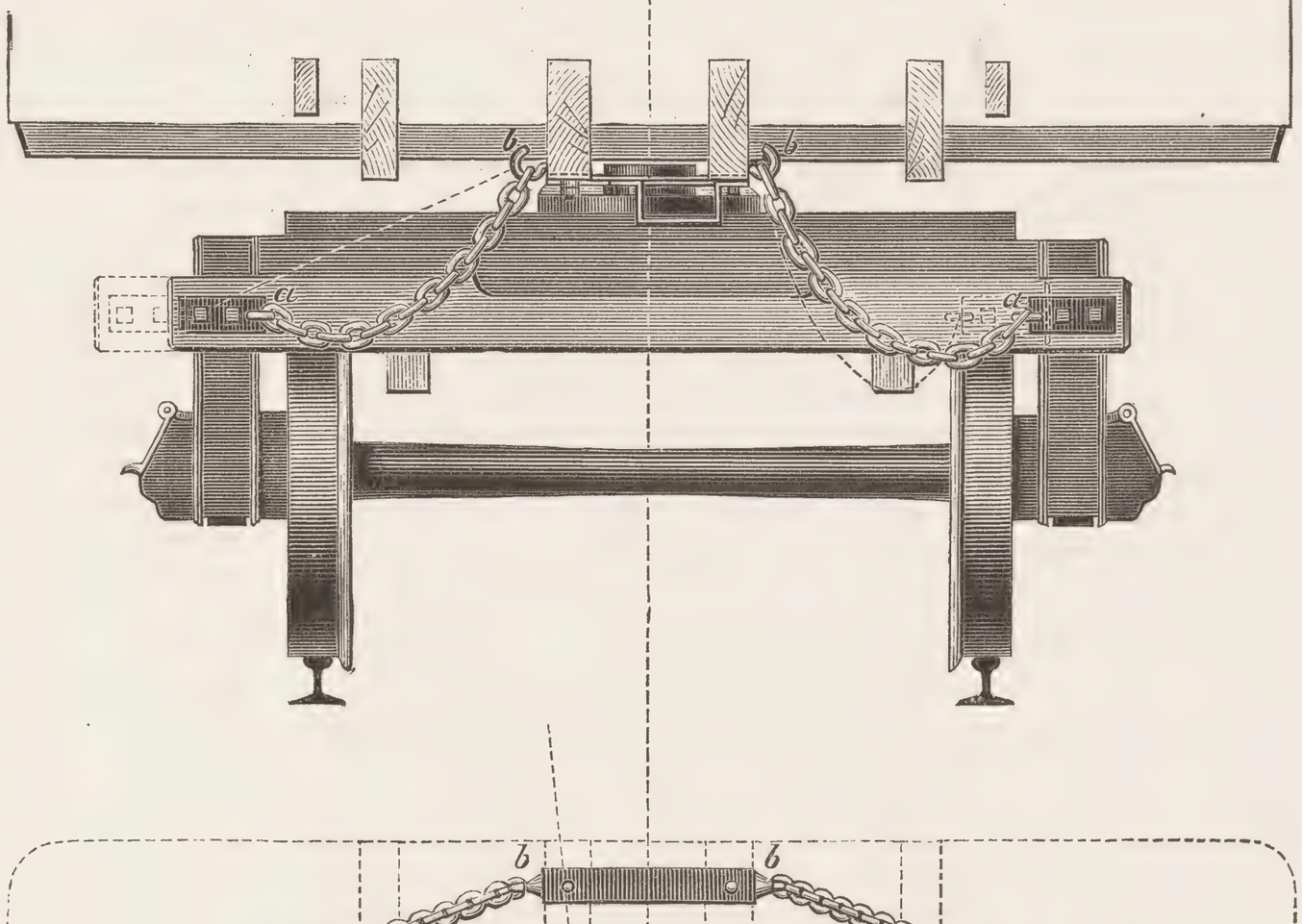


Fig. 2.

In case, however, of a broken wheel, or if the forward wheels should fall into a cattle-guard, or culvert, or other opening in the road-bed, this method of attachment would not hold the truck up as well as if the chains were fastened to the side-sills; but probably both contingencies can not be equally provided for by any one method. The strength of the fastenings is the main thing when check-chains are brought to a practical trial. Whether the plate bolted to the under side of the draw-head timbers is sufficiently strong will depend of course upon the bolts; but would it not be capable of more resistance if bolted on top of the timbers?

A Smokeless Furnace.

THERE is in operation in Glasgow what is claimed to be a smokeless furnace. The operation is described as follows: The coal is placed in a hopper, over the front part of the furnace, into which it drops in small quantities through a couple of apertures. It is not necessary to open the front-door of the furnace, except to see how the fire is getting on; for by a simple mechanical readjustment, the man in charge of the furnace may regulate the quantity almost to an ounce. As it is added to from above, the coal sinks down, and slides slowly until it reaches the bars from the bottom of the furnace. These bars are acted upon by plungers, which carry them forward together, with their layer of coal on the top, and then, an eccentric being applied, every third bar in the series is brought back to receive a fresh supply. In this systematic and continuous way the furnace is fed with coal, which passes right through in slow and easy stages, the same quantity of fuel being at all times in exactly the same state. Combustion is, therefore, perfect; the smoke is burned up, and the waste fuel is discharged, in the form of clinker or slag, into the ash-pit.

MR. E. O. RICHARDS, of Quebec, has invented a car-brake that, if published reports can be relied on, will be a vigorous competitor of other brakes for the favor of railroad men. At a recent trial, a train consisting of an engine, tender, and three baggage-cars, running at 40 to 45 miles per hour, was completely stopped by this brake in from five to six seconds, although the brake was only a temporary one and worked at a disadvantage. It also stops the train when some of the cars are off the track.

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Editorial Announcements.

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No.* 32 *Warren Street.*

Advertising Rates.—*For one square, or one fifth of a column,* $5 *per month, or* $50 *a year. For half a square,* $3 *per month, or* $25 *a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. Dinsmore, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Engravings and Illustrations.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in The National Car-Builder *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Unsettled Problems.

The future prosperity of a large number of railroads in this country will depend upon the application in their management of such a system of economy as will not only lessen the cost but increase the efficiency of their operation. The important point with managers and their subordinates in every department, is to make the best use of the best material. Any thing short of this is waste in one form or another, which diminishes profits, demoralizes the service, and leads to embarrassment, default, and bankruptcy. During the flush times which preceded the panic, earnings were good; there was a liberal margin between receipts and operating expenses, and consequently less concern about small leakages in the way of unnecessary expenditure. All that is changed now. We have got, as it were, down to hard-pan, and must reconstruct on a new basis — a basis of economy. This requires, among other things, a more thorough and systematic test of materials of all kinds, and their economical adaptation to specific uses. There must be more technical research, experiment, analysis, and careful observation, a clearer elucidation of scientific principles, and greater accuracy in reaching results, so that when a point is once settled, there will be an end of it.

Any one who is at all familiar with the mechanical details of railroad operation is aware how many unsettled questions there are in regard to methods of construction, the merits of various appliances, the intrinsic qualities of metals, and many other things, a correct knowledge of which is greatly to be desired. Unscientific outsiders are at a loss to understand why there should be such a diversity of opinion and practice among railroad men, after the system has been in successful operation for more than thirty years, on a scale of the greatest magnitude, and with the best mechanical and engineering skill enlisted in its service. It seems to them that all questions about friction, the size of journals, gauge of track, dead and paying weight, rivet-holes, ventilators, and a hundred other things, including the hardest worked and most wonderful problem of the age—how to couple cars surely, cheaply, and without peril to those who do the coupling—ought to have been substantially settled by this time. They can see little or nothing in all this that should tax the ingenuity of inventors, and be made the subjects of discussion year after year. A little figuring and experimental testing would seem, from their point of view, to be all that is necessary to bring order out of chaos, and settle all disputed points on such an infallible basis of truth as to command universal acceptance. It seems, doubtless, a very easy matter to most people, to steer a ferry-boat, edit a newspaper, or keep a hotel, the intrinsic difficulties of which are never realized until such enterprises are actually undertaken. So it is with railroading. There are difficulties which grow with the growth of the system, known only to the initiated, and which can only be surmounted by systematic organization and effort—difficulties involving the intangible elements and hidden forces of matter, in regard to which our knowledge is exceedingly limited and must remain so until research, experiment, and study shall improve it.

Hitherto, railroad mechanics have sought to elucidate these questions, or at least to make some progress in that direction, by organizing associations for mutual consultation. Much advantage, it must be admitted, has resulted from this plan, but not all that should or might be expected. Statements of individual experience and comparison of views at annual meetings, have not been as full and unreserved as they should have been. The majority of those in attendance are usually silent, either from diffidence, or because they have nothing to say; and if no decided action is taken upon any given subject, it is mainly owing to the lack of a proper basis in the shape of accurate and well-digested information. This information is sought to be obtained by sending out circulars, with a series of questions so framed as to cover the whole ground in regard to any particular topic. If the replies to these questions were full and explicit, if they embodied the best results of the best thinking, conscientious study, and careful investigation; if, in a word, they were the product and outcome of unstinted labor, and this a labor of love, and not a mere dutiful compliance with a formal request, condensed into a few monosyllables of yes and no, they would afford valuable material and data from which reports could be made that would give an enviable repute to the transactions of such associations, and speedily and definitely settle many open questions which are clearly susceptible of solution. But unfortunately, many of the circulars so issued are not responded to at all, and the great majority of replies are such marvels of brevity as to convey little or no information that is worth having. If this indifference is to continue, it will be impossible for committees to present any thing valuable in their reports, and the associations to which they belong will be obliged to abandon this most excellent method of collecting information; and unless some other more effective plan can be devised, the usefulness of these organizations will be virtually at an end. To survive, they must necessarily be progressive and show results. They must be sustained and vitalized by something besides good intentions, or the truth of the well-known proverb about a certain kind of pavement in use in a certain unwholesome locality, will be verified once more and again.

In this connection we would call attention to a matter which was broached at the last meeting of the Master-Mechanics' Association, and which, in our judgment, received less favorable attention than it deserved. We refer to the project of a Mechanical Laboratory to be established under the auspices or cooperation of the association, and to be provided with such instruments, apparatus, and machinery as may be requisite for making such experiments and tests as are required in the practical operation of railroads. Could such an adjunct to the association be properly organized and conducted, the advantages to be derived from it would be very great. Mooted points in regard to the quality and strength of materials, the resistance of trains, the value of fuels and lubricants, the nature of friction, and a host of other things, could be authoritatively determined, and save any amount of fruitless talk, perplexity, and guess-work. So long as each road does its own experimenting and testing in a loose, irregular, unscientific way, as is apt to be the case, there will be an immense loss of money and time in the aggregate, and with no adequate corresponding gain. Instead of each road incurring the expense of settling the vexed questions which are now pending, and others which are sure to arise in the future, it could be done more effectually, and far more cheaply, in the way suggested.

We are glad to be able to say that the Stevens Institute of Technology has already taken the initiatory steps for establishing such a Laboratory, to be under the direction and management of Professor Thurston, who, together with the trustees of the Institute, assumes all the responsibility, and only needs the aid of the different associations which are immediately interested. It is to be presumed that the integrity of its management will be such as to secure entire confidence, and that the terms and conditions can be arranged so as to be mutually satisfactory to all parties. The Institute is one of high repute, and is under the direction of purely professional men. The results of experiments and investigations made under its sanction can hardly be otherwise than conclusive, while the cost will be largely reduced as compared with the aggregate of expense of individual experimenting. The steps already taken are little more than preliminary, the immediate results of which will be a nucleus capable of being developed into an institution of great value to many branches of mechanical industry, and especially to the mechanical interests of railroads.

"A Penny Saved is a Penny Earned."

Could the author of this familiar maxim have foreseen the extent to which its hollow jingle has imposed upon the public generally, and especially upon railroad managers in this present year of grace, he would surely have qualified it by some allusion to that other maxim about saving at the spigot and wasting at the bung. In the absence of clear views as to how, in any particular case, the pennies are to be saved, specious catch-phrases like that we have quoted for our heading, are very apt to deceive. Economy is now the watchword of railroads, and never before was there such a demand, or rather inquiry, for cheap tools, wheels, axles, springs, upholstery, and every thing embraced in the category of supplies and equipment. "Poor Richard" is a stalking terror in work-shops and managers' offices. Expenditures for articles of necessary consumption are restricted to a zero standard, and purchases are made under the impression that manufacturers and dealers can afford to furnish first-class stock for fourth-class prices. These mistaken notions of economy will have their day and ultimately correct themselves. There is no evading the inexorable laws which regulate trade and all the manifold relations of supply and demand, and which provide that the buyer, in spite of all appearances, disguises, and subterfuges, shall get what he pays for—no more and no less. This is the inevitable outcome of the fallacious ideas of economy now prevailing; and should there be no abatement of the present frenzy, we shall soon expect to see some of our railroad men looking for bargains among the rubbish of auction-rooms, their ears tantalized with the "going, going, gone, cheap as dirt," lingo, so efficacious in knocking down glued furniture, stuffed watches, and shoddy trumpery generally.

To exhibit the folly of this kind of economy, we propose to take a single article by way of illustration, and show how little a nominal low price has to do with actual cheapness. We examined a few days since, a rubber car-spring, manufactured since the year commenced, and which had been in service only a few months; yet it had burst in warm weather, and under a load which would have taxed only a tithe of its capacity had it been made of decent stock. The master of car repairs connected with the road on which the spring had been used, said it was a fair specimen of what was in the market; and although in making his requisitions he invariably specified "good rubber," the springs purchased were inferior in quality, and he was obliged to use them or not use any. Good springs had to a great extent disappeared from the market, or could not be had at ruling prices established by the rivalry and competition among manufacturers. He used what he could get, the first cost being the main consideration with the road managers; and he could only listen in the mean time, with as much complacency as possible, to the complaints of his superiors about the increased cost of repairs over that of former years, or as compared with that of other roads. This is not an isolated or exceptional case, as many similar statements have been made to us by parties connected with car-repairing departments. As a commentary upon this, we assert that rubber springs can be found to-day on some of the older cars on our Eastern roads, that have been in use twenty years, subject to the greatest extremes of temperature, and although badly worn, are no doubt even now capable of rendering better service than half the so-called cheap springs now pressed upon the market at prices which are extravagantly dear at half the money.

The ingredients employed in the manufacture of a first-class spring of the kind referred to, are good Para gum, white-lead, and sulphur, the general formula being about one pound each of the rubber and lead, and one ounce of sulphur, this last being merely a vulcanizing agent, the action of which is similar to that of yeast in bread-making. The lead gives to the spring a durable metallic body or base which is not perishable but remains unimpaired as long as the spring lasts; it also gives it a dark color, a soft velvety feeling to the touch, and a greater range of action under pressure, without setting; in short, it is the vehicle by which the rubber does its work, and bears the same relation to the life of the spring that an axle does to the working capacity of a wheel. Springs made of these ingredients are heavier and cost more, bulk for bulk, than the ordinary qualities. As a rule, one cubic inch of such rubber will weigh $1\frac{1}{8}$ ounces, while much of the material in springs made now will not exceed $\frac{3}{4}$ of an ounce per cubic inch. Now a spring of the kind we have described can no more be furnished at present ruling prices—say from 35 to 45 cents per pound—than solid ware can be furnished for the price of plated, and for the simple reason that the material and labor involved in its manufacture costs in the neighborhood of 65 cents for every pound of spring. How then can manufacturers put so-called rubber springs into the market at half the actual cost of a first-class, good, and serviceable article? We shall see.

There is just now an insane clamor for low prices, irrespective of any intrinsic value in the article purchased, and this clamor is appeased in the only way in which it can be appeased, namely, by substituting cheap material for good, and by cheapening still more by adulteration what is already too cheap to be good for any thing. Fifty per cent of the white-lead is replaced by whiting, which blends with the rubber, gives greater bulk to the spring, and deprives it of its essential working capacity, which is its body. Would any intelligent railroad manager care to have his house painted with a kind of paint having whiting instead of lead as a base? and would he regard the use of such material as economical because the job could be done at half-price? The cheapening process, however, does not stop here. The proportion of lead is still farther reduced, and some of the whiting even is made to give place to marl and other substances having no affinity with the rubber, and only uniting with it mechanically. The rubber itself is of course the lowest grade to be found in the market—say inferior Central American—with a liberal infusion of "shoddy," or old car-springs ground up. If any Para rubber is used with this, it is only enough to save appearances; and the result of this cheapening, mixing, adulterating process is a spring only in form and name, which can be sold at Cheap John prices, but which is practically worthless.

In order to give master car-builders and others an idea of the difference in the cost of a good rubber spring and a poor one, we will here give a formula or enumeration of ingredients from which it is safe to say that thirty per cent of the springs now put upon the market are made: To 1 pound of Central American gum—the poorest that can be had—add $1\frac{1}{2}$ pounds of old rubber springs, or "shoddy;" $\frac{1}{2}$ pound of white-lead; $\frac{1}{2}$ pound of whiting; $\frac{1}{4}$ pound of marl, and 2 ounces sulphur. The cost of these several articles is easily ascertained, and we think if railroad men would carefully figure it up for themselves, instead of giving heed only to the reduced prices at which springs are offered, irrespective of quality, they would see more clearly where the joke comes in, and act accordingly.

The penny-wise and pound-foolish policy we have attempted to illustrate in the matter of rubber springs, is by no means confined to this one item of railway expenditure. Deterioration keeps pace with this left-handed economy in respect to steel springs as well. The quality of these is getting to be as uncertain and variable as the weather, notwithstanding the improvements in the manufacture and working of the material. A few years ago, a good volute buffer could be easily obtained. Those made by the old Metallic Car-Spring Company were recognized as a standard; they were equal to every reasonable test and met every reasonable requirement. The best of steel was used and the greatest skill employed in their manufacture. As a bearing or bolster-spring, capable of withstanding the vibrations and shocks of wheel concussions, they failed, from causes inherent in their peculiar construction and form; but as a buffer they were unrivaled, and would be to-day were the same skill and material employed in making them; but "Poor Richard" has been among the steel-makers, and the quality must be accommodated to the price. It is now next to impossible to get a good volute buffer-spring, one that will stand the test to which they were subjected a few years ago. There is no longer a recognized standard, not because of any defect in the principle of their construction, but solely on account of a cheapening of material and the employment of workmen deficient in skill and experience. The result is shown by an inspection of scrap-heaps, and the increasing expenditure for this class of repairs. So we might go on and show that one article after another in the category of railway supplies is falling away from its former standard of excellence because it must be furnished at a lower price; and the longer this delusion lasts, the worse it will be for the roads. *First-cost* is now the gauge and criterion of economy; but the results in the long run will sooner or later become apparent, and prove to be improvidence, wastefulness, and ruin.

Train-Men.

It is safe to say that no class of employees in any business is subject to such continuous, exacting, and dangerous service as railroad train-men, a service which from its nature can not be regulated by prescribing so many working hours per diem. The endurance of the worker is presumed to be equal to the demand made upon him, and this varies according to emergencies, but seldom falling much behind his capacity. There is, however, a point of exhaustion beyond which the physical energies can not be taxed without permanently impairing health and strength; and it should be the aim of all judicious railroad management that this point shall not be exceeded in the duties imposed upon operatives in the regular routine of business. We have heard of instances in which engine-men have been required to be on duty for thirty or more consecutive hours, and then after four or five hours' sleep, were compelled to perform the same service again; and so on, until the overtaxed system succumbed, followed by prolonged illness and a stoppage of pay from the date of such illness. Such cases are of course exceptional, mere irregularities, it may be, incident to badly-managed roads, and not likely to occur on those that are well managed; but they serve to indicate the abuses to which the administration of railroads is liable when controlled by officials with no experience in the handling of a throttle-valve, or any practical acquaintance with the lower grades of service. The wages of train-men are not so much above the ordinary scale as to compensate for any extra hardships imposed upon them in addition to the hazards inseparable from their vocation, the yearly aggregate of lives sacrificed and bodies maimed being far greater than the current estimates, and more than are caused by all the other catastrophes in the form of shipwrecks, explosions, fire-damp, etc., which at intervals startle the world.

In view of the peculiar perils and responsibilities of this class of railway operatives, and the arduous labors performed by them, it should be regarded as a criterion of good and competent management, that no injustice be done to them by over-exaction, stinted wages, neglect to promote the deserving or to provide support for such as are crippled or worn out in the service. The risks to which train-men are exposed are to some extent analogous to those incurred by the soldier engaged in active hostilities, and they are as much entitled to be pensioned in case of disability. It is hardly to the point to say that the service is voluntary and amounts to a virtual contract to assume the risks incidental thereto. This might do if the pay was commensurate, or sufficient to enable such employees as a class to insure themselves. And, besides, new men rarely comprehend the extent of the danger, and are consequently more liable to mishaps, or they may actually realize, as is often the case, a sort of exhilaration or pleasure in facing danger in which quickness of eye and dexterity of hand are the only guarantees of safety.

We have faith that the time is at hand when railway companies and managers will have more concern for the health and welfare of their employees, as a matter of wise economy. It will tend to elevate the moral standard of the service by establishing a bond of sympathy between head, heels, and intermediates; promotions will be made on a basis of merit; brains will be recognized; every man will feel that he is justly appreciated; will work with less of the stolid indifference of a mere machine, and yield a readier acquiescence in the carrying out of all orders and regulations.

ERRATUM.—On page 37 of the Annual Report of the Master Car-Builders' Association, eleventh line from the bottom, Mr. Adams is made to say that "the air is conveyed into the car by a board, etc." It should read *blower* instead of board.

A FINE sleeping-coach has just been completed at the Chicago shops of the Rock Island and Pacific road, under the superintendence of B. K. Verbryck, the master car-builder. It is 65 feet in length and 10 in width, has six-wheeled trucks and standard axles of the "M. C. B." pattern. The interior has 12 sections, and the general finish is extremely tasteful and elegant. Gilt pilasters are introduced with a somewhat new and novel effect. The coach is called the "City of Chicago," and cost $15,000.

MR. W. H. HIPPLE, the retiring master-mechanic of the Texas and Pacific Railway, was presented with a valuable watch and chain by the employees of the road. The presentation took place at Marshall, Tex.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the rooms of the Association, 113 Liberty street, on Thursday evening, Sept. 17th. Owing to the inclement weather which prevailed, the attendance was small. The car-builders present were Messrs. D. Hoit, F. D. Adams, L. Garey, W. E. Chamberlain, J. T. Leighton, V. D. Perry, C. A. Smith, Willis Davis, E. A. Olmstead, and others.

The special subject which had been previously announced for consideration was the "Dictionary of Terms," and a portion of the evening was spent in discussing the progress of the work and the difficulties which remained to be overcome in order to insure its completion. A resolution was adopted requesting the Secretary to invite Dr. Tilden to prepare a paper on Wood, to be read at some future meeting; also another resolution requesting Mr. M. N. Forney to communicate with Professor Thurston, and invite him to exhibit his testing machine for iron and steel, at the rooms of the Association at such time as may suit his convenience.

The next meeting will be held on the 15th of October. The subject for discussion will be Car-Wheels, including the best method of fitting, causes of flange-wear, breakage, etc.

Master Car-Painters' Convention.

THE delegates to this convention met at the Mansion House, in Buffalo, on the 2d of September. Car-painters were present from thirteen different States. The president of the association, Mr. George O. Widner, called the meeting to order and delivered a short and appropriate address. The minutes of the last previous meeting were read by the secretary, Mr. M. W. Stines, and approved. In the course of the first day's proceedings, there was an animated discussion on the comparative merits of different woods, and also of iron, for purposes of car-paneling. On the second day, reports were made by sundry committees, and various topics discussed, including the adulteration of oils. Committees were appointed to report at the next annual meeting; also a committee on subjects for discussion, and another on amending the constitution of the association. Officers were chosen for the ensuing year as follows: President, M. W. Stines, Boston and Albany, Springfield, Mass.; Vice-President, R. G. Beasley, Maine Central, Waterville, Me.; Secretary and Treasurer, R. McKeon, Atlantic and Great Western, Kent, O. The convention then adjourned to meet in the city of New-York on the first Wednesday of September, 1875. Foreman car-painters of all shops in the United States and Canada are requested to be present; and master car-builders and master-mechanics having charge of paint-shops are requested to have such shops represented.

The above mere formal summary of the doings of the convention is all we are able to obtain of the proceedings. We should be glad to publish an outline of the discussions and the reports of committees, if the secretary would furnish them, as they doubtless embody much information that would be interesting to car-builders, car-painters, and railroad men generally.

A Narrow-Gauge Railroad.

THE most complete example of a narrow-gauge railroad in this country, we believe, is the Denver and Rio Grande road, in Colorado. The track is three feet wide; it runs from Denver almost due south, not far from the base of the Rocky Mountains, and with a full view of some of the grandest peaks and summits of the range. It is an ambitious little road; it proposes to go ahead southwardly till it reaches El Paso, on the Rio Grande, south of Sante Fé, when it will branch into two lines, one going to the City of Mexico, the other to Guyamas, on the Pacific. It has actually been built to Puebla, in Colorado, 118 miles south of Denver, with a branch, 37 miles long, to Labaun. Its gross earnings for 1873 were: From passengers, $180,538; freight, $200,130; other sources, $11,986; total, $392,654. The operating expenses were $197,174, only about fifty per cent; the net earnings, $195,529. The total cost of the road, with its equipment (13 locomotives, 19 passenger and baggage-cars, 169 freight-cars and 116 coal-cars), has been $6,324,000. Its capital stock is $3,308,000, and its funded debt is $3,020,500, the latter bearing 7 per cent interest. It will be seen that its net earnings fell a little short last year of paying its interest, but this is not so unfavorable for a partially built road in a new country. There is little doubt that when it reaches Sante Fé, it will pay its interest and leave something over.—*St Louis Republican.*

Recent Patents.

IMPROVED CAR-BRAKE.—Edmund I. Hockaday, Pleasant Hill, Mo.—A sliding bar is applied to the under side of the car, provided at both ends with buffer-heads. Its whole length is somewhat less than the distance from draw-head to draw-head, in order to allow for the compression of the draw-head springs. It connects with the brake mechanism by a chain with double end parts, so that the brake may be operated by pulling the sliding bar in either direction. The tender is provided under the rear draw-head with a short sliding buffer-rod, which is operated by means of a pulley and chain, from a brake-shaft and wheel at the forward end of the tender. The buffer-rod is guided under suitable inclination back of the rear truck of the tender, and projects, when in regular position, beyond the draw-head far enough to take up nearly the entire slack space between the tender and first car. On the discovery of sudden danger, the engine is reversed, or its motion is retarded, so that the momentum of each car carries it forward the full length of its slack, and produces the action of the buffer-rod of the tender on the sliding bar and brake of the first car, which carries back that of the second, and so on till the whole train is acted upon by the brakes in a perfectly automatic manner. In order to release the brakes and back the train, the engine is slightly moved forward, and a brake-wheel connecting chain is released, so that the buffer-rod drops out of position and discontinues its action on the sliding bar.

IMPROVED CAR-COUPLING.—Benjamin B. Harris, Lockport, Ill.—This invention consists of a pivoted drop-latch with a slotted spring-slide and recessed balance-weight back of the latch for bearing therein, and holding it in coupled and uncoupled position. The link is carried against the drop-latch, which is placed in position in the slot in front of the sliding spring plate. The drop-plate is forced back thereby, together with the sliding plate, until the inclined end is released from the same and swings back, allowing the entrance of the link to the cavity, and simultaneously therewith the forward motion of the sliding plate into its former position. The link strikes then the balance-weight, and causes thereby the pressure of the front end on the shoulder part of the drop-latch, so that the same is carried down on the sliding plate and firmly bound thereon. The link slides along the drop-latch up to the shoulder when pulled, and has thereby sufficient play for the oscillations of the cars. For uncoupling, the sliding spring plate is connected by means of a side slot of the draw-head and rod with a suitable lever mechanism, so that by moving the spring plate in a backward direction the drop-plate may be released, and on swinging forward uncouple the link.

IMPROVED STEAM-ENGINE.—John W. Hayes, Chicago, Ill.—This is a contrivance of the piston and the ports for employing the piston for the valve. The piston is made hollow, receives the steam into a hollow space, and discharges it therefrom to the cylinder. The motions for opening and closing the ports are effected by a stud-pin projecting from the interior of the cylinder into a spiral slot in the piston. The stud for causing the oscillation of the piston is formed on the end of the steam-pipe. The exhaust-pipe is adapted for the application of a suction-pipe, and the piston is adapted for being reversed endwise to convert the engine into a force-pump by reversing the ports relatively to the inlet and exhaust. The invention also consists of an oil-jacket surrounding the cylinder, with a valve for admitting the oil into the cylinder as it is needed for lubricating the piston.

IMPROVED DEVICE FOR MOVING RAILWAY CARRIAGES.—Christian Anderson, Paxton, Ill.—This invention consists of a little frame of metal adapted to be readily connected temporarily to a car. It has a crank-shaft, reducing gears, and a chain-wheel mounted in it, with a chain to work on the chain-wheel, and a griper at one end. It is carried along the rail in advance of the car, and attached for holding fast, while the car is drawn along by winding the chain-wheel. This, by holding fast to the chain as it rolls along it, pulls the car readily to the point where the chain is fastened to the rail. The frame also carries a box below the chain-wheel into which the slack chain falls.

IMPROVED LOCKING-NUT.—Casper Dittman, Leacock, Pa.—This invention consists in a nut-lock which aims not only to prevent the backward rotation of a nut under the influence of jars and jolts, but to automatically take up the expansion and contraction of the bolt under different temperatures.

MR. CHARLES FELLOWS, who has been the master-mechanic of the Lake Shore and Tuscarawas Valley Railroad since it commenced operations some two years ago, has resigned his position. His successor is Mr. W. F. Turreff, who has been assistant master-mechanic, for the past ten years, of the Cleveland and Pittsburg road. On the occasion of the retirement of Mr. Fellows from the position he has so creditably filled, the employees of the car and locomotive departments of the road presented him with an elegant tea and water service as a token of their respect and esteem. After the formal presentation had been made in the presence of the employees, who had assembled in the machine-shop for the purpose, Mr. Fellows invited all present to repair to his house, at Elyria, in the evening, whither they were taken by a special train provided by the superintendent, and where they were most agreeably and hospitably entertained. The employees in the above-named departments, while very much regretting the resignation of Mr. Fellows, have the fullest confidence that his successor will worthily and acceptably fill his position.

AN electric alarm has been devised to notify the engineer in case of a separation in long freight-trains and a parting of the bell-cord without sounding the engine-gong. It consists in placing a magnetic bell-hammer upon the engine, together with a small electric battery, and in providing each car with a set of wires, joined by flexible joints, so arranged that while the train remains united all is well; but should any of the car-couplings or wires break, the gong on the engine will instantly commence ringing. The same device may be employed by the conductor to give any signals that he may desire to the engineer, from any part of the train.

THE new shops of the Baltimore and Ohio Rail road Company, at Newark, Ohio, consist of a store-house and office, 100 feet by 50, already completed; a boiler-shop, in progress, 70 x 180 feet; a blacksmith-shop of same dimensions; a foundry, 70 x 200; a car-shop, 230 feet in diameter and 75 in the clear, with a central turn-table; a wood-working shop, 70 x 200 feet; and a locomotive shop, 275 feet in diameter with 30 stalls. All the buildings are of brick, and, together with the yard, occupy an area of 22 acres.

AN English writer recommends well-sifted white-wood sawdust, cut with the grain and mixed with talc or plumbago, as a good material for steam-packing. Another writer says in regard to it, "This is, in itself, a good antri-friction material, but I do not think the addition of plumbago would be of any use. I fear, however, that the action of steam would soon destroy the elasticity, and make it like a ring of solid wood. Once, being in a hurry to pack the gland of a piston-rod, I filled the stuffing-box with finely-chopped straw. Not the least steam escaped through the interstices, and it required but very little compression, the mere weight of the gland serving to keep it steam-tight. I thought that I had made a good discovery, that would save a continual source of trouble, but at the end of a few days' work the straw suddenly went rotten by the continued action of the steam, and blew out like coffee-grounds. Oat-husks are more enduring, and equally steam-tight. The experiment proved that a continuous yarn or gasket is not essential for steam-packing, but that small pellets of something or other having elasticity and steam-enduring properties, will do equally well, and be far more easy to extract than old hard junk, to hook out which to the very bottom is sometimes a troublesome job."

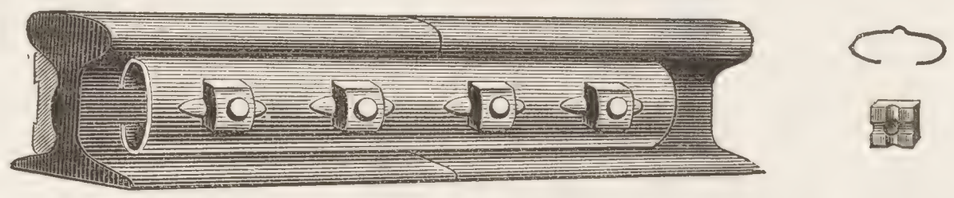
THE TRAVELER'S OFFICIAL GUIDE.—The October number of this valuable publication is promptly at hand, containing the time-tables of the various roads in detail, official lists of officers, sailing of ocean steamers, etc. The latest changes in the running time of roads are also announced. The through time-tables are very full and complete. A page is also published supplementary to *The Gazetteer of Railway Stations*, noting the changes which have been made since that valuable work was issued. The *Guide* is $3 a year, or $3.50 postage paid; and the *Gazetteer* $1 in paper binding, or $1.50 in cloth.

WE have received from J. A. Fay & Co., of Cincinnati, a very finely illustrated and descriptive catalogue of wood-working machinery of which they are the manufacturers. Many of these, including planing, matching, moulding, and mortising-machines, are well known in car-shops. Recognizing the principle that the true mission of machinery is to save labor, and that its cost and capacity of doing good work are its true test, this firm has given special attention to improvements bearing upon these points. In machinery, efficiency is the primary requisite, and mere cheapness a secondary matter. It is not possible to build a first-class machine for a second-class price and have it perform its specific work in the best manner and in the shortest time; consequently low-priced machines are never cheap. A maximum amount of work, with a minimum of labor, is the standard for estimating the value of all labor-saving devices, and to this standard it is the aim of this establishment to make its products conform. The long experience of the firm in the design and construction of this class of machines, with their largely increased facilities and extended reputation, entitle them to a liberal patronage. The catalogue referred to is worthy of examination by all users of wood-working machinery.

THE MAN WITH THE PAPER CAP.—Donn Piatt, in the Washington *Capital*, makes the following significant statement: "Parents may as well learn, especially American parents, anxious for the welfare of their sons through life, that the man in the 'paper cap' is coming to the front. The mechanic bids fair to be master of the situation—the governing agent socially and politically hereafter. While, as a body, the mechanics grow more powerful and influential, every day from their midst come not only the master minds that lead and control civilized humanity, but the learned men in the professions, whose names adorn science and art. On the other hand, the universities and colleges graduate bar-tenders, billiard-markers, and a hundred and one other places of refuge for the sons of wealthy families fallen into decay."

Patent Spring Fish-Plate Joint.

THERE have been many attempts to secure a perfect rail-joint by preventing the bolts and nuts which hold the fish-plates, from working loose. It is evident that in order to accomplish this, some elastic medium must be interposed between the rail and the nuts, and of such a nature as to absorb the vibration and relieve the nuts of a strain which no mere locking device alone has proved sufficient to counteract. In the invention illustrated by the engraving, this medium is provided, and consists of a steel plate or longitudinal rib, with its upper and lower edges bent inward against the stem of the rail. On the opposite side is an ordinary wrought-iron plate, and the two



are held in place by bolts of the usual pattern, but upon which the nuts are securely locked by projections on the plate which fit into corresponding grooves on the inside face of the nuts and hold them fast at every quarter-turn. These grooves, and a cross-sectional form of the elastic spring-plate, are shown in the small detached drawings. The device is a combination of a nut-lock and fish-plate, the spring of the plates bearing constantly upon the nuts and protecting them from the effects of jar and vibration, while they are at the same time prevented from turning. The advantages of the arrangement are obvious; and the cost does not exceed that of the ordinary wrought-iron plates. Orders may be addressed to Vose, Dinsmore & Co., 32 Warren street, New-York.

ADHESIVE GUM-ARABIC MUCILAGE.—A solution of alum, or what is still better, of sulphate of alumina, added to ordinary gum mucilage, will render it much more adhesive and prevent it from being absorbed by unsized paper. It will also adhere to metal, wood, glass, and other substances from which it ordinarily falls off. Only a small quantity of the solution is necessary to secure this result.

WATER-PROOF GLUE.—A glue which is said not to be affected by moisture may be prepared by dissolving 1 oz. sandarac and 1 oz. mastic in half a pint of alcohol, and adding 1 oz. white turpentine. A very thick glue is then to be made, to which some isinglass is to be added. The alcoholic solution is to be heated to boiling, in a vessel, and poured gradually, with constant stirring, into the warmed glue, until the whole is intimately mixed together. The mixture is finally to be strained through a cloth, and is then ready for use, and is to be applied hot. It dries quickly, becomes very hard, and pieces of wood united with it do not separate in water.

HARDENING THE SURFACE OF STEEL.—Mr. G. Armes, of Rochester, has proved that the surface of steel may be hardened, without hardening the mass of the metal, by placing the steel—a cylinder, for example—upon an engine-lathe, and, while it is in motion, bringing into contact with it an emery-wheel, rotating at a velocity of about 1800 revolutions a minute.

CEMENT FOR ATTACHING LABELS TO METALS.—Take 10 parts tragacanth mucilage, 10 parts honey, and 1 part flour. The flour appears to hasten the drying and renders it less susceptible to damp. Another cement that will resist the damp still better, but will not adhere if the surface is greasy, is made by boiling together 2 parts of shellac, 1 part of borax, and 16 parts water. Flour-paste, to which a certain proportion of sulphuric acid has been added, makes a lasting cement, but the acid often acts upon the metals.

TO REMOVE IRON-RUST.—Wet the spots of iron-rust on muslin or white dress-goods thoroughly with lemon-juice, then lay in the sun to dry. Repeat the same if the color is not removed by one application. When dry, rinse in clear cold water. Lemon-juice can not be used on colored goods, as it will take out printed colors as well as stains. It will remove all kinds of stains from goods.

GREASE ON CARPETS.—Cover the grease-spot with whiting, and let it remain until it becomes saturated with grease; then scrape it off, and cover with another coat of whiting, and if this does not remove the grease, repeat the application. Three coats of whiting will, in most cases, remove the grease, when it should be brushed off with a clothes-brush.

IRON-CLAD PAINT—We would call attention to the superior merits of this article as vouched for by a large number of testimonials of the highest character. It is, as its name implies, strictly a mineral paint, made from the purest Lake Superior iron ore, and has already been extensively introduced. It is fire-proof, resists atmospheric changes, has a good body, spreads and covers well, is specially adapted to metallic surfaces, and is cheap and durable. It is used with the most satisfactory results for car-bodies and roofs, as well as for bridges, houses, implements, etc., lasting five times longer than ordinary paint. The specimens exhibited to us comprise various colors and are very finely pulverized. For car-painting, it is mixed with pure boiled linseed-oil and Japan dryer. Manufactured by the Iron-Clad Paint Co., Cleveland, Ohio. The reader is referred to advertisement on another page.

Facetiæ.

A DARKEY was once attempting to steal a goose, but a dog raised an objection, and Sambo retired. The next night, during a thunder-shower, he attempted it again, and just as he was on the point of getting away with his fowl, the lightning struck close by, and the noise nearly frightened the poor fellow to death. Dropping the goose, he started away, muttering, "Peers to me der am a mighty lot ob fuss made 'bout a common goose."

AT some place out West, where the commissariat appears to be imperfectly organized, a youth was seen furiously scratching at the side of a gravelly hill.

"What are you after, my friend?" inquired a passer-by.

"After a ground-hog I saw run in this hole."

"Why, you don't expect to get him in that way?"

"Git him! *Bound* to git him! *We're out of meat!*"

A NEGRO, says the Atlanta *News*, was very busy eating a water-melon at the Whitehall crossing as the State road train came in, when the locomotive with its glaring headlight struck him and landed him some rods out in the darkness. As he picked himself up, he exclaimed, "Who swung dat lamp! who frowed dat brick!" The locomotive is but slightly injured.

SAID a Pennsylvania political orator, warming up as he approached the climax of his speech, "Let us conduct this campaign, fellow-citizens, upon the principle enunciated by the immortal Lincoln, 'With malice toward all, and charity for none.'"

IT must indeed be dry in Kansas, if it be true, as a local paper says, that "the suffering catfish lies stranded on the blistering bottom of his late happy home, waving his tail in the crisp breezes as a signal of distress."

THE only thing that it bothers a grasshopper to swallow is a four-legged table. A well-developed hopper can worry it down, but the legs tickle his throat.

THE San Francisco sea-captain who traded the ship's Bible for thirteen plugs of tobacco, is spoken of very severely by the religious press of that city.

JEWETT'S PERFECTLY PURE LINSEED OIL RAW, BOILED & REFINED.

MANUFACTURED BY

JOHN JEWETT & SONS,

182 Front Street, New-York.

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This is the **ONLY QUALITY** of White Lead that we have made for the last 16 years.

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182 Front Street, New-York.

January 1, 1874.

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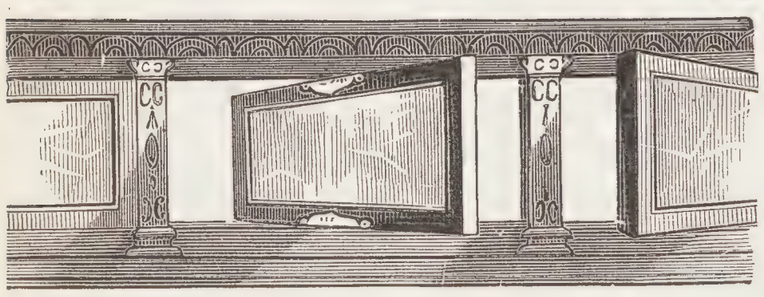

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Car Ventilators, Car Blinds, Etc.

THE *REGULATOR* is a simple apparatus for adjusting the position of Car Ventilators, etc. It holds the ventilator securely at any angle at which it may be placed, and does away with the more costly and complicated mechanism now in use upon many cars. It is **Cheap, Durable,** and in every respect the **Best** apparatus for the purpose ever introduced upon railroad cars.

We direct the attention of Car Manufacturers and others, to the valuable use to which the **Regulator** may be applied, in enabling the traveling public to have **Blinds** with **Movable Slats** upon railroad-cars. Hitherto the continual shaking of a vehicle in motion has rendered it necessary to construct blinds with stationary slats, thus obstructing the view, and admitting of no ventilation. The **Regulator** obviates these inconveniences by giving firm support to the slats, and holding them in any desired position.

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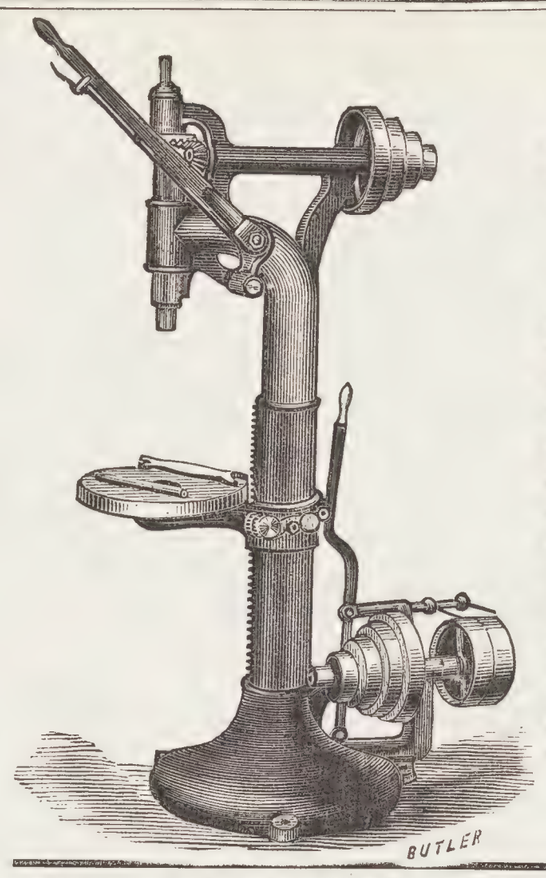

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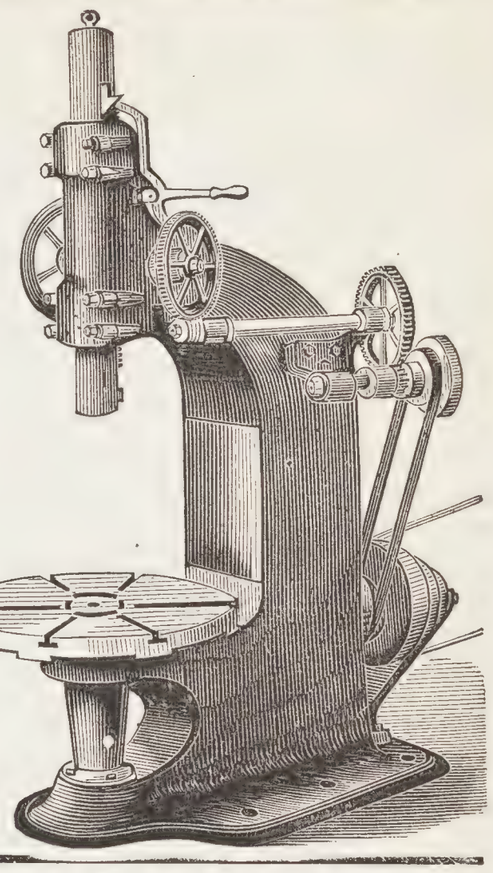

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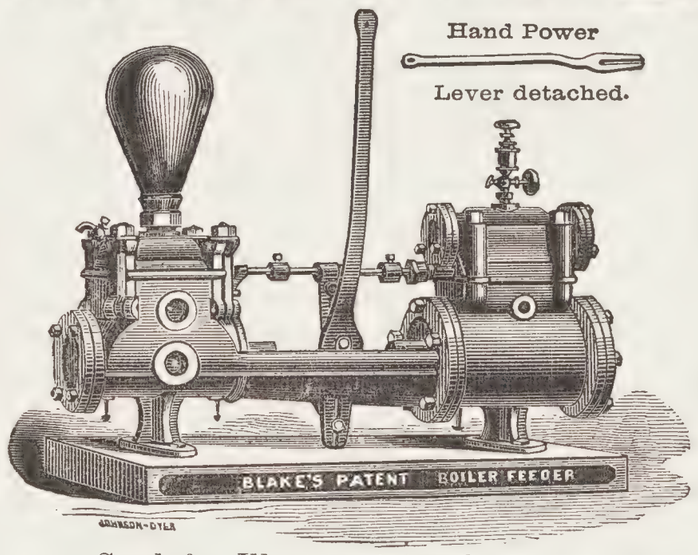

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DEVLAN'S PATENT ELASTIC WASTE,

It being composed of Incombustible and Lubricating Materials, "Hot Journals" are impossible where the Waste is properly used.

Certificates from Railroad Officials, showing its very decided advantages, are herewith annexed—namely:

PENNSYLVANIA RAILROAD—NEW-YORK DIVISION, JERSEY CITY, July 11, 1873.

GEO. W. BARKER, ESQ., Superintendent New-York Division:

DEAR SIR: By your directions, October 8, 1872, I packed parlor car No. 222 with Devlan's Patent Elastic Waste. The car has made its regular trip ever since up to June 5, 1873, when it was taken in for repairs, without having a hot box, and the waste of the first packing was in it yet. There were six or seven pounds added, to keep it up during this time, which would have taken thirty or forty pounds of wool waste to do the same work. Very respectfully,

[Signed,] S. THOMAS, General Car Inspector.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co.: PENNSYLVANIA RAILROAD, JERSEY CITY, July 12, 1873.

DEAR SIR: In conformity with your request herewith find enclosed statement of General Car Inspector. Car No. 222 gave us a great deal of trouble until I ordered your Elastic Waste. Mr. Thomas tells the rest.

All that I can say is that I think so highly of it that I would prefer it to any other packing that has been brought to my notice.

Yours respectfully, etc., [Signed,] GEORGE W. BARKER, Superintendent.

DELAWARE, LACKAWANNA AND WESTERN R. R. CO., SCRANTON, PA., August 1, 1873.

P. S. DEVLAN, Esq., Superintendent Elastic Waste Co., New-York:

DEAR SIR: I take pleasure in giving you my opinion of your Elastic Waste. I have used it now ten months in our passenger cars, and now use it in all our cars, including our coal cars. We have no trouble with hot boxes since we have used it. I consider it a great saving to the company, as one-third less the weight packs a box than it requires of cotton waste; it wears at least four or five times as long, and requires less oil. The great value is, it always keeps up to the journal, and does not pack down and go to mud like cotton waste. In all my experience in railroading I have never seen anything to equal it, and I can truly say you have the most valuable article ever used for that purpose, and believe it only requires a fair and thorough trial to convince any railroad man of its great value. Yours respectfully, [Signed,] ROBT. McKENNA, Superintendent Car Department.

OFFICE, ELASTIC WASTE COMPANY, No. 60 BROADWAY, NEW-YORK.

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Arlington Car Manufacturing Co.....Arlington, Vt.
Barney & Smith Manufacturing Co.....Dayton, Ohio.
Baker, Jackson & Co.....Latrobe, Pa.
Bellefonte Car Manufacturing Co. .....Bellefonte, Pa.
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Cape Fear Building Co.....Abbottsburg N. C.
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Corunna Car Co.....Corunna, Mich.
De Pere Iron-Works.....De Pere, Wis.
Detroit Car-Works.....Detroit, Mich.
Detroit Car and Manufacturing Co.....Detroit, Mich
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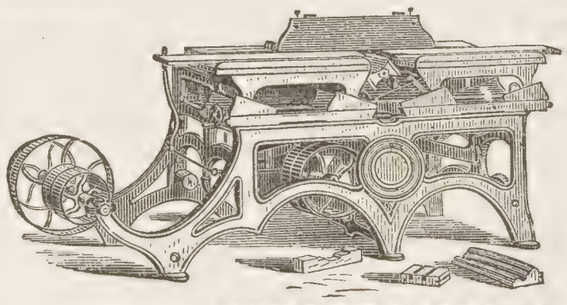

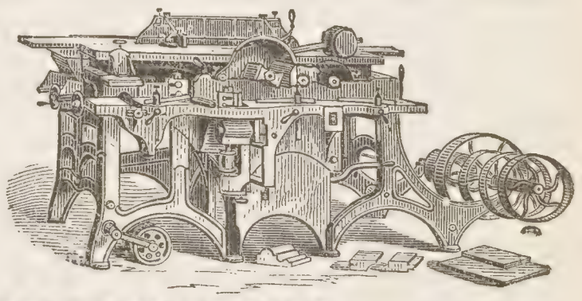

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Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
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Boston & Maine		D C. Richardson.	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
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Cairo & Vincennes	R. Williams.		Cairo, Ill.
California Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and branches	‡‡C. E. Benton	††C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach.	Catasauqua, Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Central of Georgia	D. D. Arden	C. C. Millar,	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas
Central R. R of Iowa	F. B. Woodruff.	T. L. Seevers	Marshalltown, Iowa
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland, Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley	A. B. Seaman,	Sacramento, Cal.
Truckee Division	James Velsir	C. Lindsay	Truckee, Cal.
Humboldt Division	H. L. Stevenson	Chas. Thompson.	Carlin, Nev.
Salt Lake Division	J. G. McCuen	Thos. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co.	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender.	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch.	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan	W. H. Dunham,	Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P. Du Chien Div		Wm. E. Kittredge.	Milwaukee, Wis.
Northern Div		John Baillie	Milwaukee, Wis.
Iowa & Minn. Div	J. Pettee.	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Cincinnati & Terre Haute	M. P. Wood		Terre Haute, Ind.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	William Cullen.	W. H. H. Allison.	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie.	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster. Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M.W. Dickerman.	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns.		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford. Ct.
Contoocook River			Concord, N. H.
Conn. & Passampsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison.	Cincinnati, Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa
Morris & Essex Division	W. H. Lewis	L S. Barber	Hoboken, N. J.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit. Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson Canal Co	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East-Tennessee & Georgia	Eli Hixon		Knoxville, Tenn.
Erie Railway	§§Frank K. Hain		New-York City.
Erie Railway	Robert Wallace		Susquehanna. Pa.
Erie Railway	V. Blackburn		Jersey City. N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	W. E. Cooper	Hornellsville, N. Y.
Erie Railway	‖D. B. Goodell	Wm. Moffet	Elmira, N. Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Erie Railway	J. Van Vechten		Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Side	Wm. La Suer		College Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler	Sanford Keeler	East Saginaw, Mich.
Fitchburg	Geo. A. Cooledge.	Enos Varney	Charlestown. Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Jno G. Coulon	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne. Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman.	T. M. Preval	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland. Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover. Pa.
Hannibal & St. Joseph	**H. L. Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton. Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes.	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia. Ill.
North Division	J. B. Edams.		Amboy, Ill
Iowa Division	Thomas W. Place		Waterloo. Iowa.
Iron	Perry Scott.	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. J. Sanborn.	R. B. More	Mattoon. Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind.
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
Knox & Lincoln.	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas.	Chester, S. C.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville, Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div.	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withycombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, Ky.
Lake Superior & Mississippi	**H. A. Towne		St. Paul, Minn.
Lake Shore & Tuscarawas Valley	W. F. Turreff	J. D. McIlwain	Black River. Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

M

Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill		Waterville Me.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman	M. W. Dickerman	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A. W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere. Wis.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	B. S. Skates	I. T. Booth	Whistler, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.

N

Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
New-Bedford & Taunton	Robert Chase	Robert Chase	New-Bedford, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland			Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston	Jas. H. Anderson	Jas H. Anderson	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
New-Jersey Southern	Rufus Blodgett		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D Billings	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
New Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Northern New-Hampshire	James W. Lander	Albert Langmaid	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div.	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.

O

Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer	John Monks	Oil City, Pa.
Ohio & Mississippi		G. Hibbard	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott		East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.

P

Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten	W. Philadelphia, Pa
Pennsylvania	E. L. Caum	Samuel W. Myers	Harrisburg, Pa.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
Philadelphia and Erie	W. L Forster		Renovo, Pa.
Philadelphia and Erie	W. L. Holman		Kane. Pa.
Philadelphia and Erie	W. T. Smith.		Erie, Pa.
Philadelphia and Erie	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach	Reading, Pa.
Germantown & Norris'n Div	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis			
Pittsburg & Columbus Division	E. Pierce	Thos. D. Furgusen	Dennison, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati. Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns		Connellsville, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland. Me.
Port Royal	Wm. Campbell	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G Taylor	H. G Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y

Q

Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific	Geo. Adams		Quincy, Ill.

R

Raleigh & Gaston			Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.

S

Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Stonington & Providence	J. H. Anderson	J. H. Anderson	Providence, R. I.
Selma & Gulf	Wm. T. Laughtrey		Selma, Ala.
Selma, Rome & Dalton	A. G. Manes	W. W. Peirce	Selma, Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mass.
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N.Y.
St. Louis, Alton & Terre Haute	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern	H. S. Smith	C. S. Buck	Moberly, Mo.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.

T

Taunton Branch	W. M. Parks	J. G. Codding	Taunton, Mass.
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tennessee & Pacific	William McKeand	William McKeand	Nashville, Tenn.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.

U

Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha. Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.

V

Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

W

Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M W Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. L. Adam	Hudson, Wis.
Worcester & Nashua	Albert Griggs.	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine. C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria. Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J N. Dubarry		Baltimore Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss.		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	C Hamilton		St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	Webster Snyder		St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua. Pa.
Cayuga Lake	J. L. Grant		Aurora, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee. Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D Wilder		Vallejo. Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	A. H. Perry	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Milliken		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton. Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡W. B. Strong		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. H. Hudson	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen.		Chicago, Ill.
Chicago & Paducah	Q. A. Stephenson	Q. A. Stephenson	Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore	A. H. Morrison	Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S S. Merrill	Robert Wason	Milwaukee, Wis.
Chicago, Pekin & Southwestern	N. V. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	E. H. Waldron	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	J. C. Buxton		Sandusky, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley			Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H. E. Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy, N. Y.
Delaware, Lackawanna & Western		G. W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese	C. D. Childs	Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	E. S. Bowen		New-York City.
Erie & Pittsburg	J. M. Kimball		Erie, Pa
Erie Railway,		Henry Bowman	New-York City.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo. N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Side	I. D. Barton		Hunter's Point, L I.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	G. B. Nichols	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb, W. J. Hilton, L. W. Morse	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific			Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H Briggs	G. E. Kilbourne	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Lackawanna & Bloomsburg		G. W. B. Cushing.	New-York City.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. L. Holden	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong.	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa.
Mahoy Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	F. N. Finney		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	John McLeod	Geo. Skinner	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	J. W. Robertson	J. W. Robertson.	Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch	S. Schoch	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. B. Greenlaw	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	H. E. Sargent		Chicago. Ill.
Michigan Central	§W. B. Strong	John Newell	Detroit, Mich.
Grand River Valley Division	J. Desmond.		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers.	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee. Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb.	G. W. Cobb	Mineral Point, Wis.
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	*Josiah Hunt.		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas		G. M. Babcock.	Sedalia, Mo.
Cherokee Division	L. S. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia. Mo.
Neosho Division	L. S. Hamilton.		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Heaning	Allan Bourn	Kansas City, Mo.
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Alabama Division	Cecil Fleming.		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Division	M. M. Miller.		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon.	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
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New-Haven & Northampton	C. N. Yeamans.	C. N. Yeamans.	New-Haven, Ct.
New-Haven, Middletown & Willimantic.	W. A. Waterbury.	W. A. Waterbury	Middletown, Ct
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New-Jersey Southern	*W. S. Sneden		Long Branch, N. J.
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New-York Central & Hudson River		C. V. DeForest.	New-York.
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Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division.	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
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Northern Central	A. R. Fiske		Harrisburg, Pa.
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North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
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Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black		Harrisburg, Pa.
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Tyrone Division	S. S. Blair		Tyrone, Pa
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West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
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Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
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Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
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Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis.	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
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Pittsburg & Cin. Division	George Webb		Pittsburg, Pa.
Little Miami Division	J. D. Ellison.		Cincinnati, Ohio.
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Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
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Western Division	C. D. Gorham		Fort Wayne, Ind.
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Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner.	W. H. Turner.	Portland, Maine.
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Portsmouth, Great Falls & Conway	J. W. Sanborn.		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I
Providence, Warren & B	Waterman Stone		Providence, R. I
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Quincy, Alton & St. Louis	N. J. T. Dana	D. A. Sweet	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
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Richmond & Danville	T. M. R. Talcott		Richmond, Va.
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Richmond & Petersburg	Augustus Shaw.		Richmond, Va.
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Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
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St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
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Nashville Division	R. H. G. Minty		Nashville, Tenn.
St. Louis, Kansas City & Northern	W. C. Van Horne.	R. W. Green	St. Louis, Mo.
St Louis Division	J. L. Hinkley		St. Louis, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson.		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
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Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac, Wis.
Shenango & Allegheny	A. L. Dunbar		Meadville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett.	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
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South-Side, Long Island	L. S. Canfield		Brooklyn, N. Y.
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Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern Minnesota	*H. W. Holley		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield, Illinois & South-Eastern	*C. A. Beecher		Springfield, Ill.
Staten Island	J. W. Wilbur		New-York, N. Y.
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Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter		Coalville, Utah.
Syracuse Northern	J. W. Moak		Watertown, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing.	Syracuse, N. Y.
T			
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Terre Haute & Indianapolis	J. E. Simpson	C. R. Peddle	Indianapolis, Ind.
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Texas & Pacific	Geo. H. Noble	Wm. Mahl	Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria & Warsaw	Jas. C. Clarke	Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western	*A. Anderson	J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson.	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
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U			
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Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
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Utica & Black River	J. F. Maynard		Utica, N Y.
Utica, Ithaca, & Elmira.	H. P. Goodrich		Ithaca, N. Y.
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Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
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Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
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Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn	J. H. Stewart	Madison, Wis.
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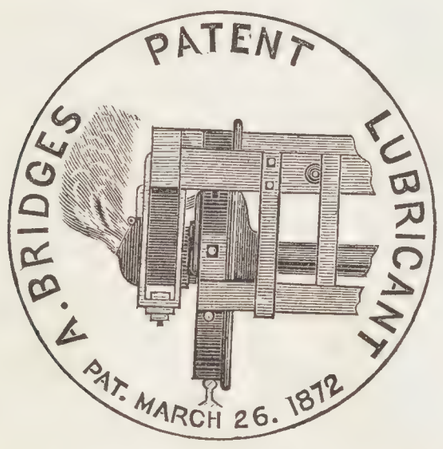

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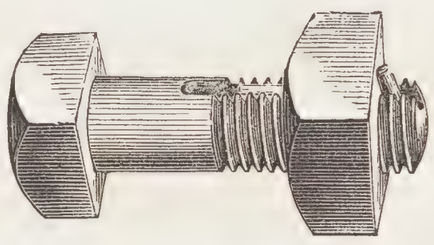
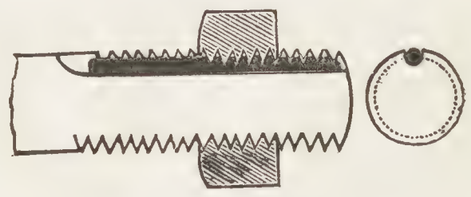


"CUMMING NUT-LOCK,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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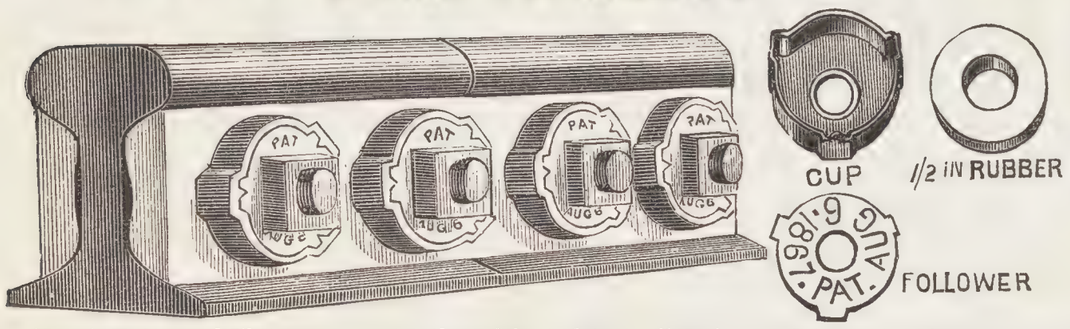
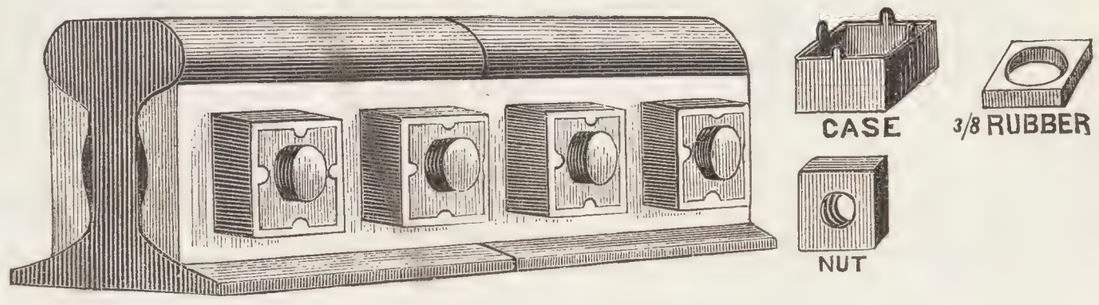


"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

The practical value of these inventions is more fully demonstrated by the two million joints now long in use.

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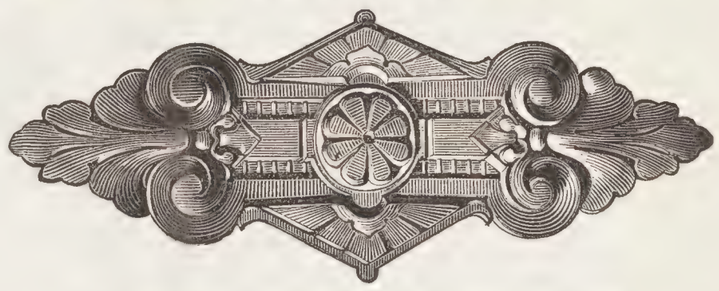

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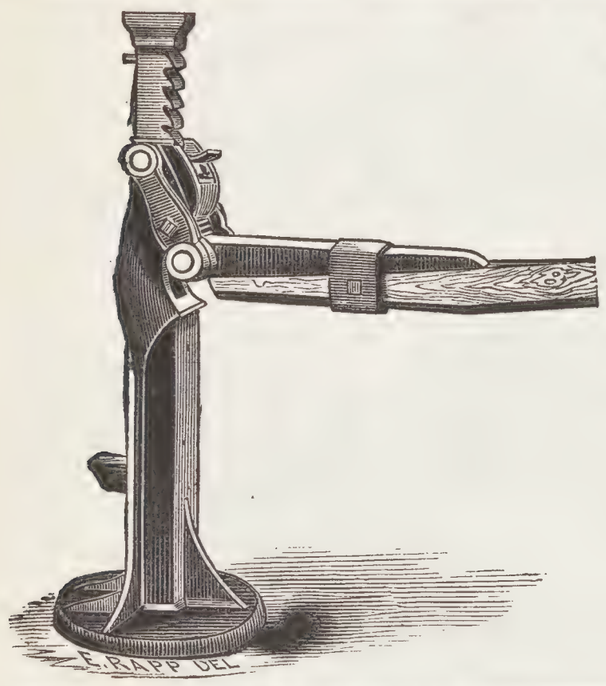

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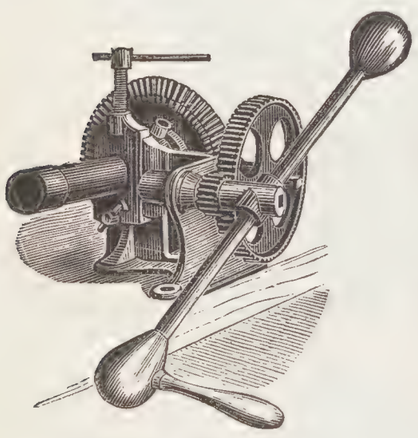

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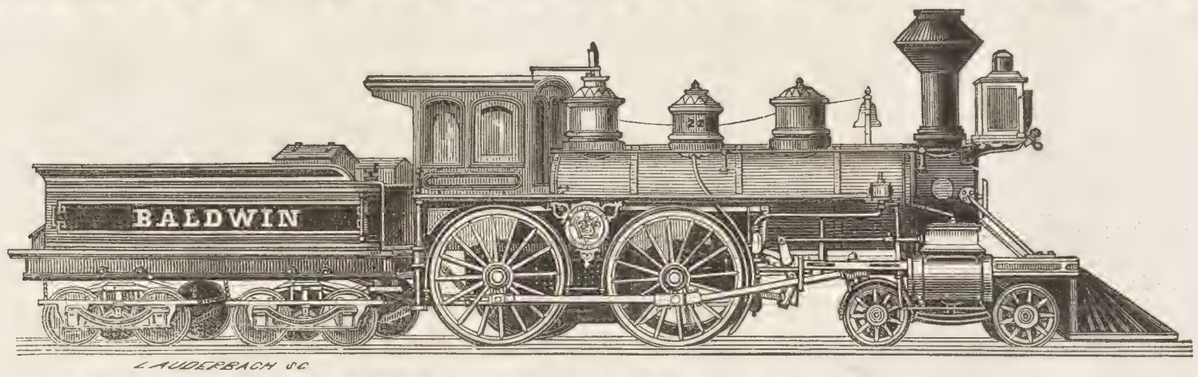

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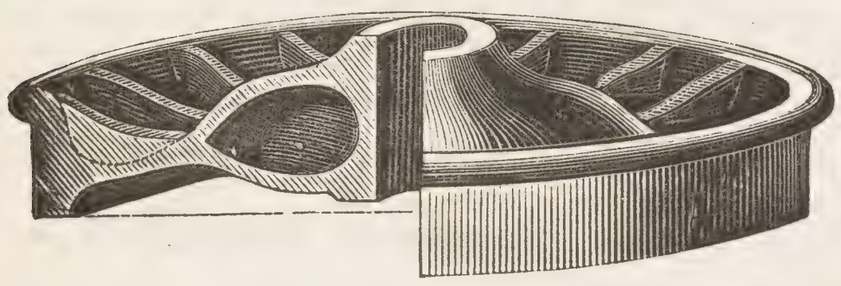

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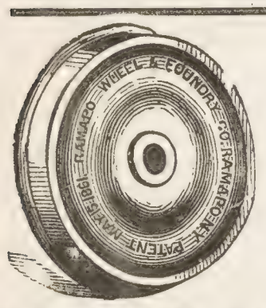

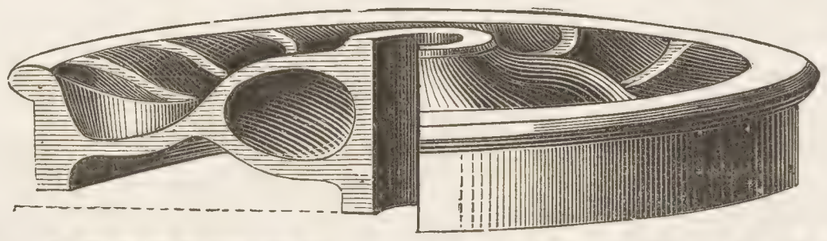

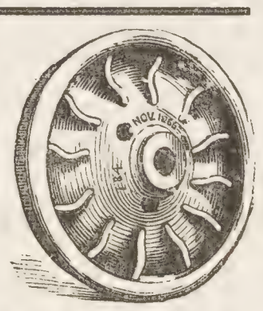

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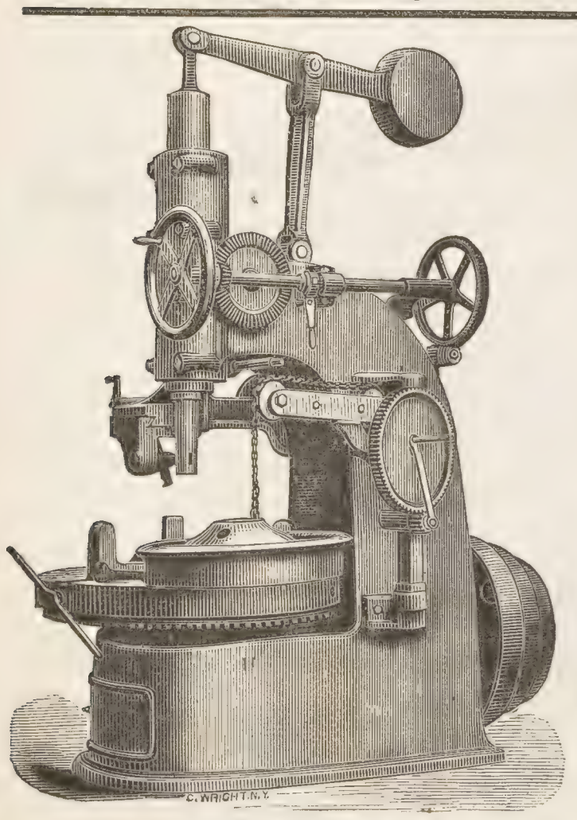

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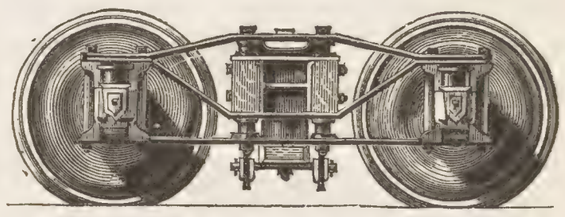

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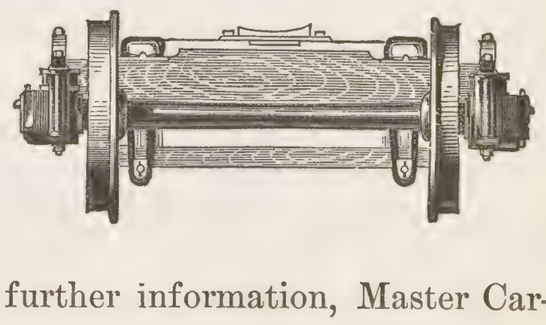

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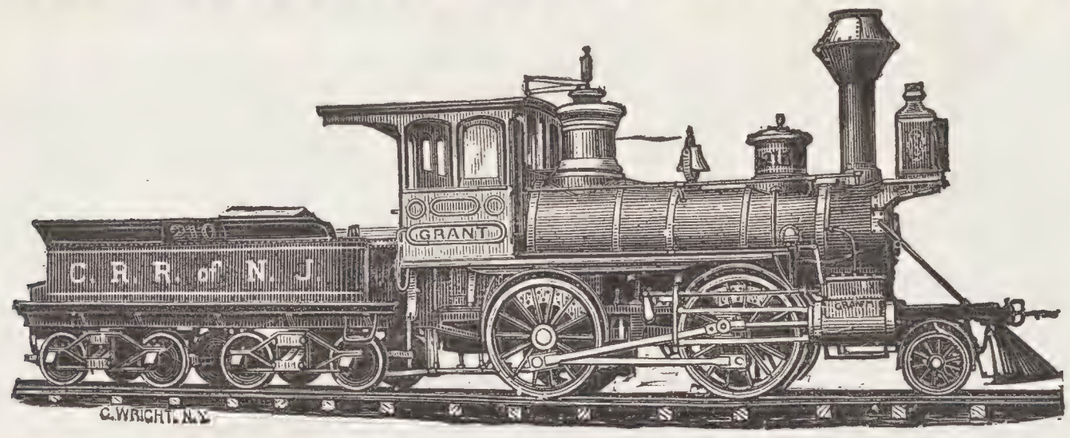

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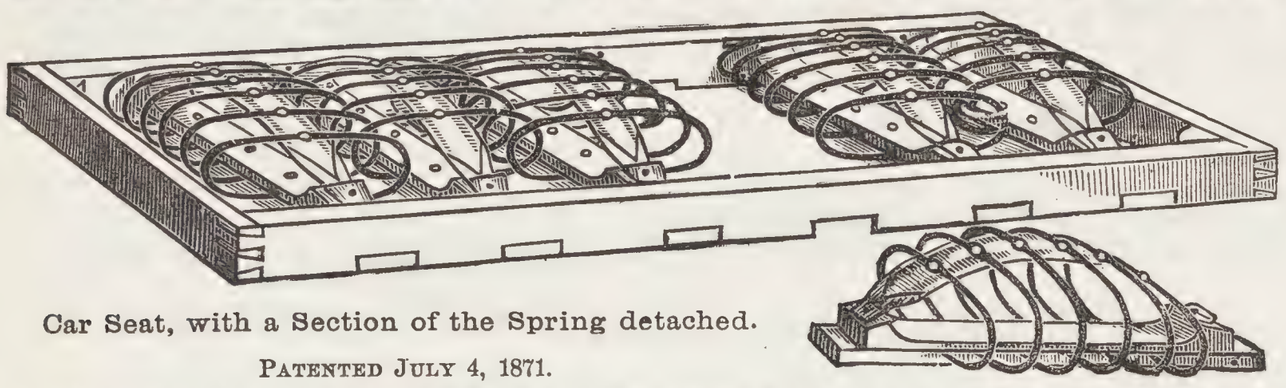

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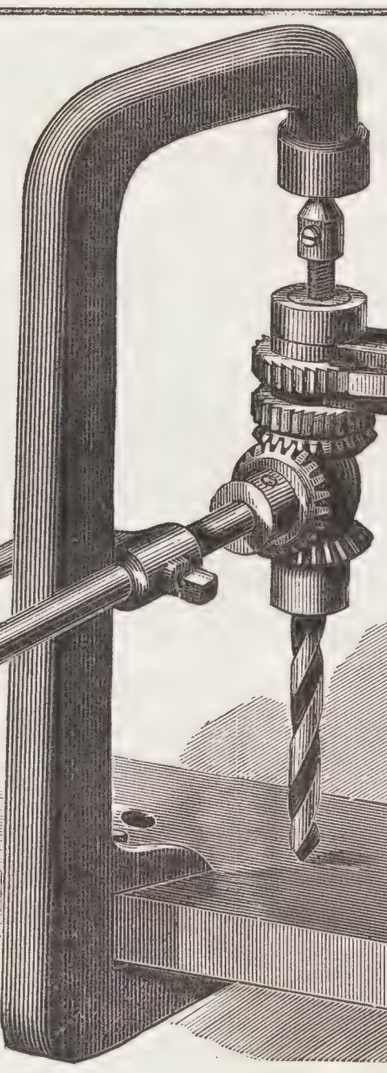

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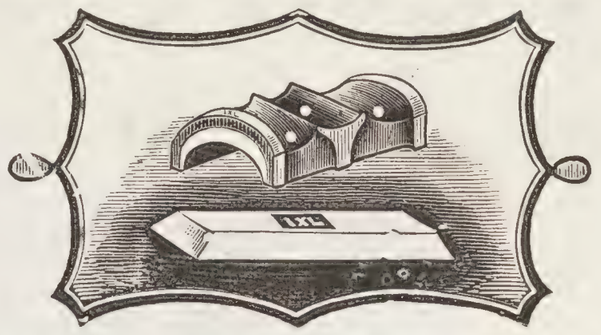

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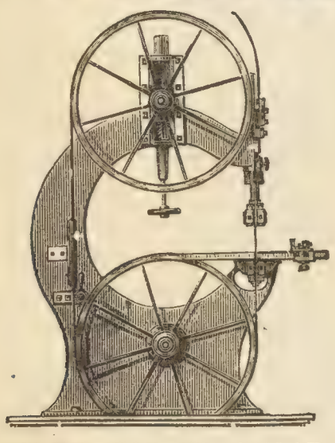

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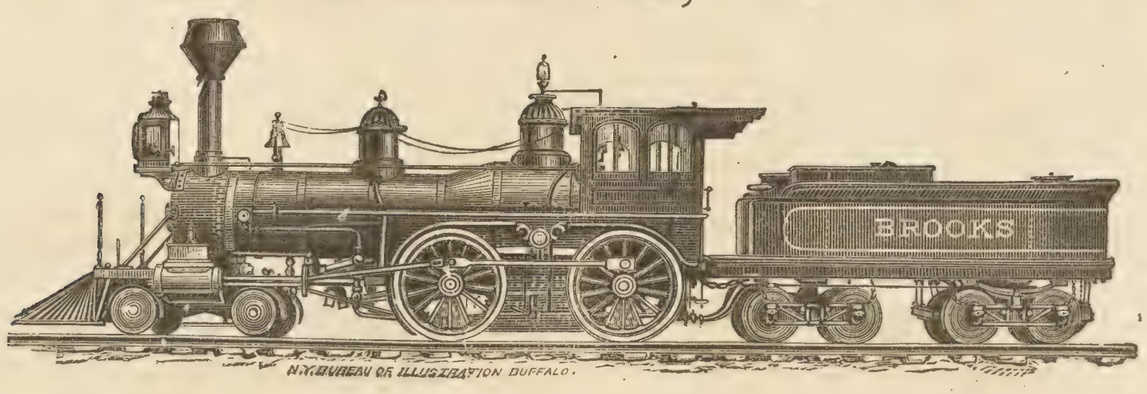

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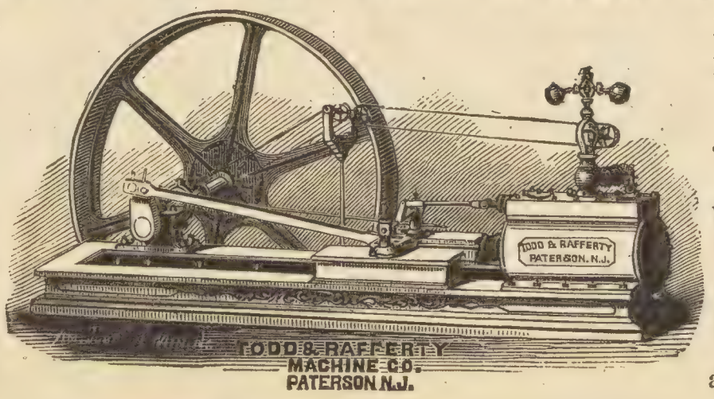

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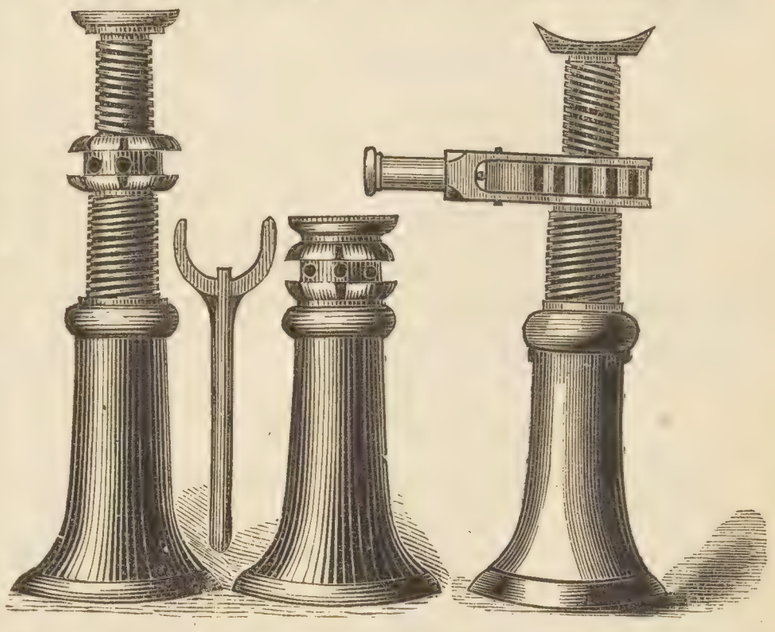

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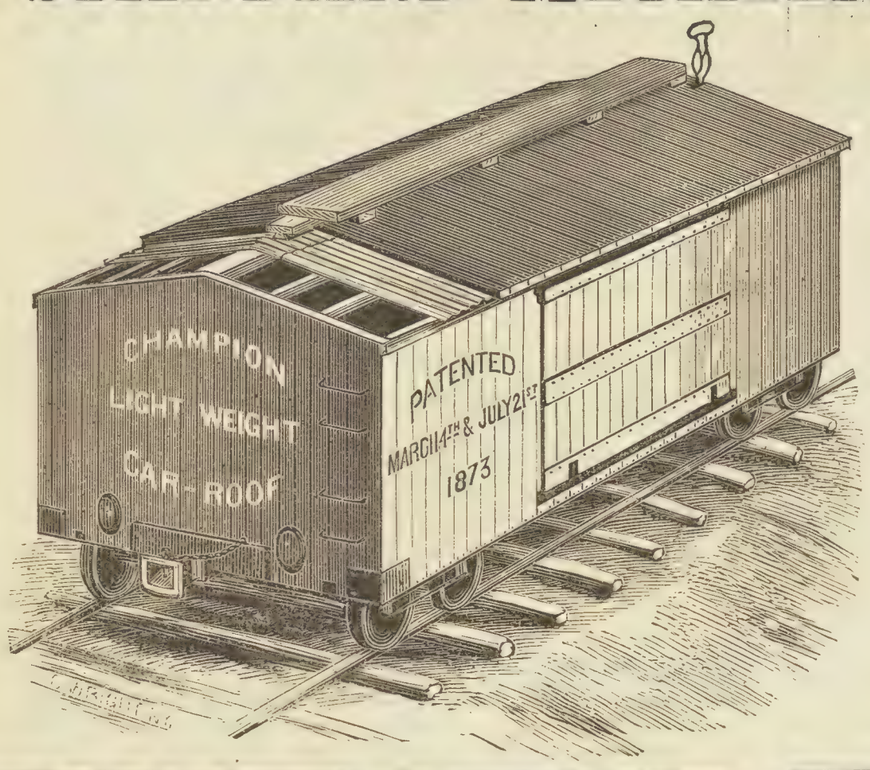

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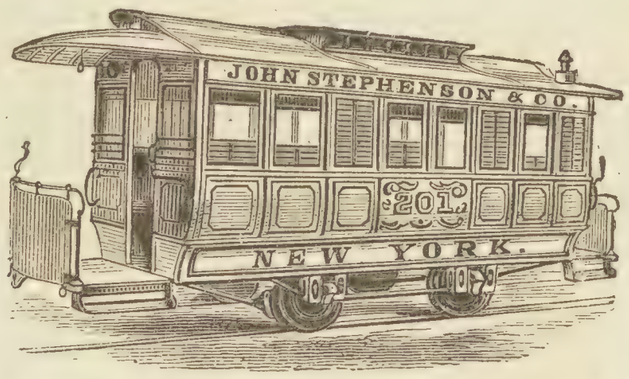

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Cut, Embossed, and Plain Glass furnished in large or small quantities, and with dispatch.

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(On line of Central Railroad of New-Jersey,)

MANUFACTURERS OF

Chilled Iron Car Wheels,

STEEL-TIRED WHEELS,

Car and Locomotive Axles and Draw Hooks.

New-York Office: No. 93 Liberty Street.

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Car Manufacturing Company

MANUFACTURE

Passenger, Mail, Baggage, Box, Gondola, Coal,

AND ALL OTHER KINDS OF

RAILROAD CARS;

Railroad Car Wheels and Castings, Bridge and Rolling Mill Castings, Bridge Rods, Bolts, and

RAILROAD FORGINGS.

Lehigh Brown Metallic Paint.

Unreservedly the best preserver of ***Iron, Tin and Wood.*** Free from Sulphur and Clay. Manufactured by the

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Three Prize-Medals, 1869-'70-'71.

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Office, 16 Broadway, New-York.

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Mason's Sperm, Manhattan Signal, Extra Lard, Tallow, and Mystic Coil Oils.

Also, Sperm Elephant, Whale, Paraffine, Machinery Elaine, and Olive Oils, for Railroads, Steamers, Woolen and Cotton Factories. Machinery and Burning.

Winslow Car Roofing Co.,

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Over 28,000 Cars now in service covered with this roof. It will last, without repairing, as long as the car it covers, and is more economical by one half than any roof in use.

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Warranted Sure Cure for

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Fancy Woods of the Choicest Kinds.

ITALIAN AND FRENCH WALNUT VENEERS,

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Butternut and Black Walnut Burls, Corrugated Ash and Black Walnut, Amboine, Thuya, Tulip, etc.

Mahogany and Walnut Planks and Boards, of Standard Thicknesses.

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2000 TONS ON HAND. FOUNDED 1810.
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OF EVERY DESCRIPTION.

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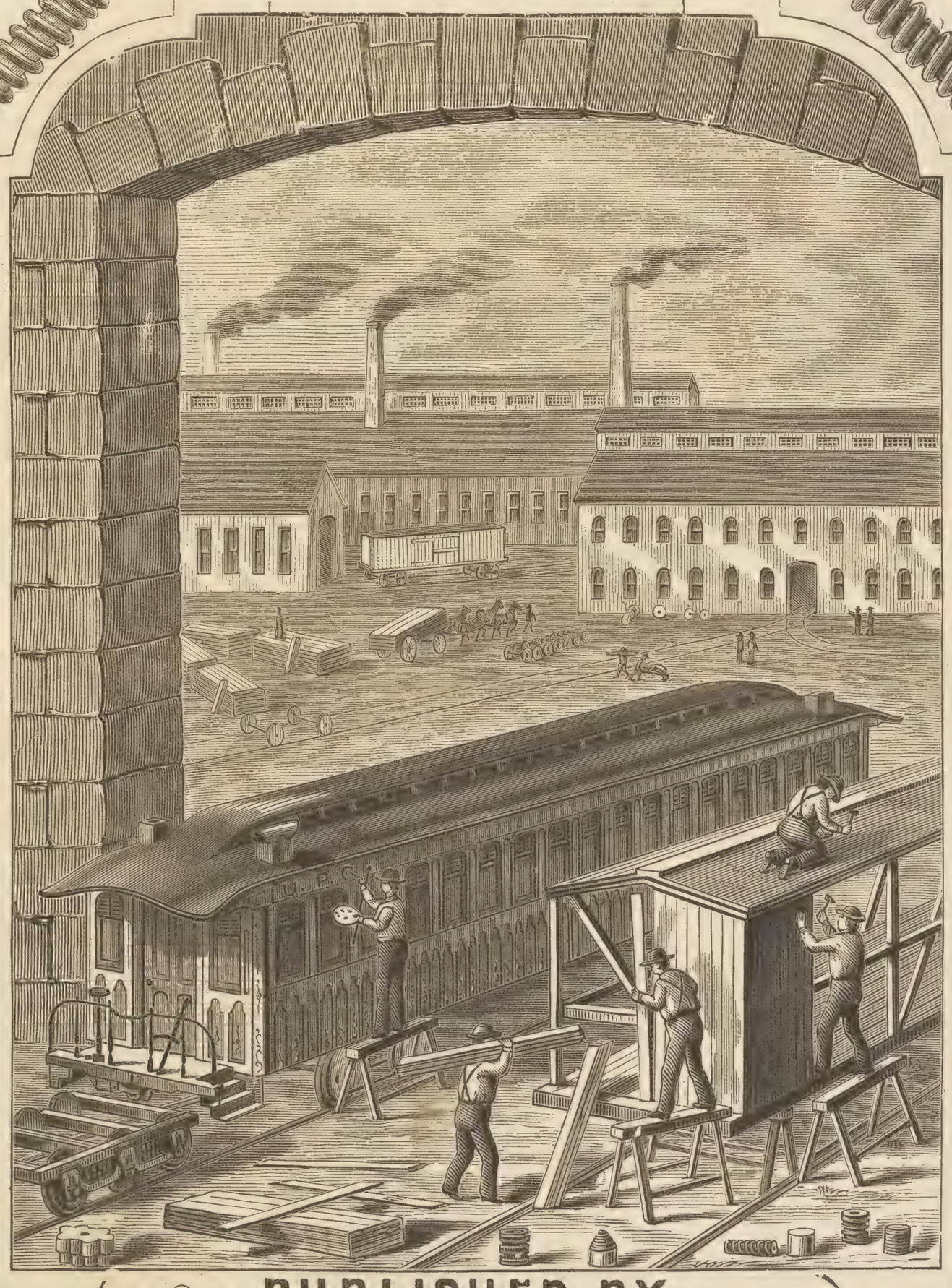
THE NATIONAL CAR BUILDER.

Devoted to the Interests of Railway Rolling Stock.

Vol. V. NOVEMBER, 1874. No. 11.



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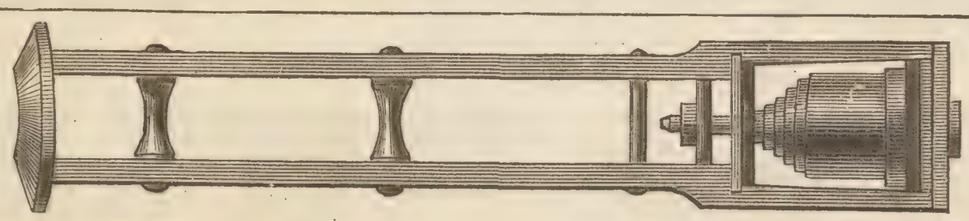

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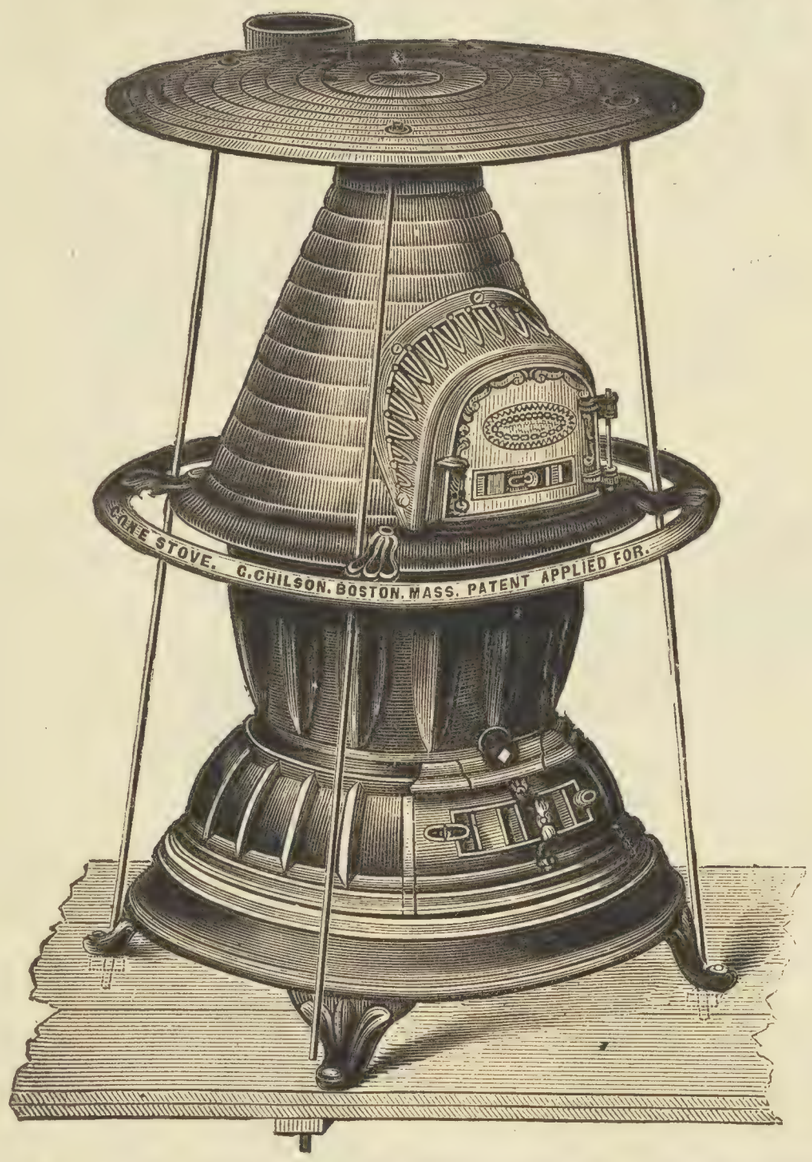
A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design*. Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories*, *Stores*, *Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms*, *Workshops*, *etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers. Yours, etc., A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

Special attention given to putting up Furnaces and Ranges, and the ventilation of buildings in any part of the country.
☞ Nothing but strictly first-class work is manufactured by me. ☜

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If any particular pattern is desired, send sample, wood pattern, or drawing, otherwise we will send our own styles.

Our tools are all made by improved machinery, designed for this purpose, and are made of the best selected cast steel.

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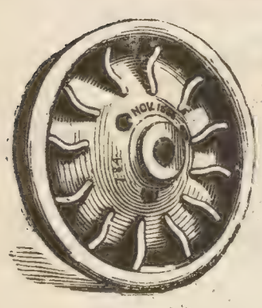
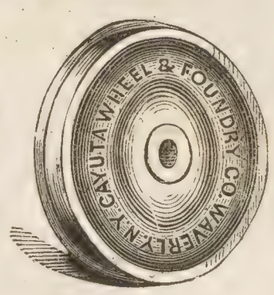


WHEELS



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WHEELS FITTED TO AXLES,

AND AXLES FURNISHED, IF DESIRED.

CASTINGS for all kinds of CARS, MINE CAR WHEELS, ETC

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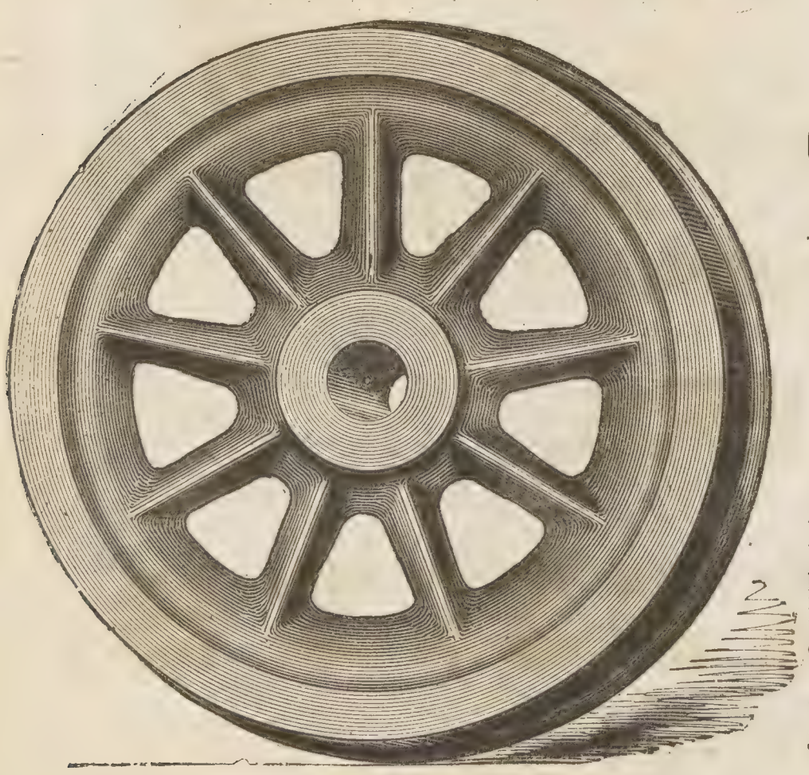
Baltimore Car-Wheel Company,

OFFICE, 15 SOUTH STREET.



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WITH OR WITHOUT AXLES.

WHEELS

OF ALL PATTERNS

MADE TO ORDER,

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This Company using strictly Baltimore Charcoal Iron, which has no superior and few equals, for making Car-Wheels,) and annealing their Wheels by the most approved process, warrant them free from strain, and equal in tenacity and uniformity of chill to any made.

W. S. G. BAKER, Pres't.
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Works cor. Essex and Concord St., Canton, Baltimore, Md.

TODD'S
Patent Coupling,

FOR FREIGHT CARS.

First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins and links alone in a very short time, there being a link always in reserve, ready for use, without liability of being lost or stolen.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

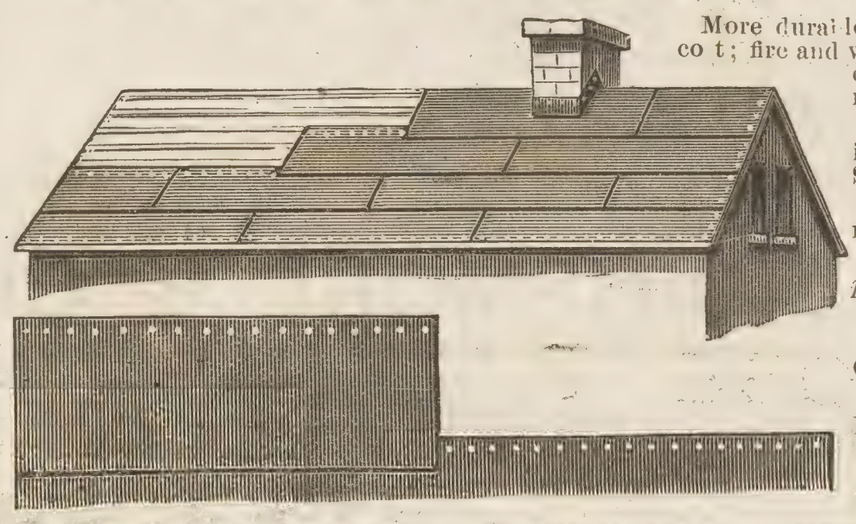
The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address ***William Todd,*** or

WILLIAMS, PAGE & CO.,

BOSTON.

EGYPTIAN ROOFING.



More durable than tin; one-half the cost; fire and water-proof; will not run or crack; for steep or flat roofs.

Unequaled for Covering Railroad Cars and Steamboat Decks.

Can be laid by inexperienced persons.

Roofing Shipped to any part of the Country.

Miner & Bannister,
Office, 105 N. Fourth St.
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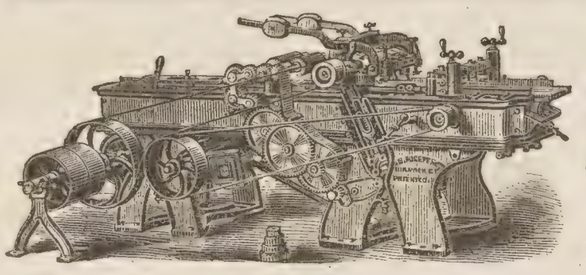
FERRIS & MILES,

TWENTY-FOURTH AND WOOD STS, PHILADELPHIA, PA.

(Take Arch, or Race and Vine Street Cars.)

Steam Hammers, Drops, &c. Engine Lathes, Axle Lathes, Cut-off and Centering Lathes, Patent Screw-Cutting Lathes, Planing and Slotting Machines, Wheel Borers and Wheel Pressers, Upright Drills, with Patent Universal Tables, Radial Drills.



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MANUFACTURERS OF THE LATEST IMPROVED

Wood-Working Machinery

Especially for Car Builders and Railroad Shops. Price-Lists Supplied

Warerooms: 109 Liberty St., N. Y.

Scale in Steam Boilers.

I WILL REMOVE AND PREVENT **SCALE** IN ANY STEAM BOILER, AND MAKE NO CHARGE UNTIL THE WORK IS FOUND SATISFACTORY. ADDRESS, GEO. W. LORD, PHILADELPHIA PA.

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Machine-Forged Nuts.

BOLTS and NUTS,

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BOONTON CUT NAILS,

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DETROIT CAR WORKS,

MANUFACTURERS OF

CARS

OF EVERY DESCRIPTION.

Office and Shops on Adair Street, near Jefferson Avenue,

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Hitchcock Car Ventilator.

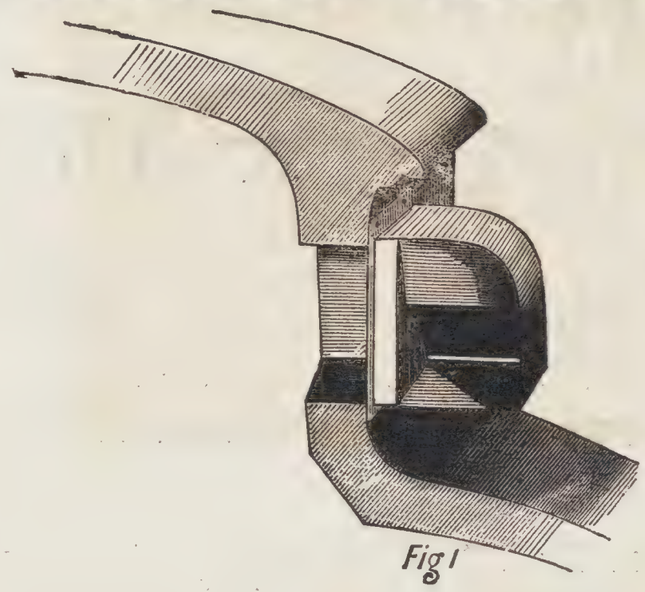


Fig 1

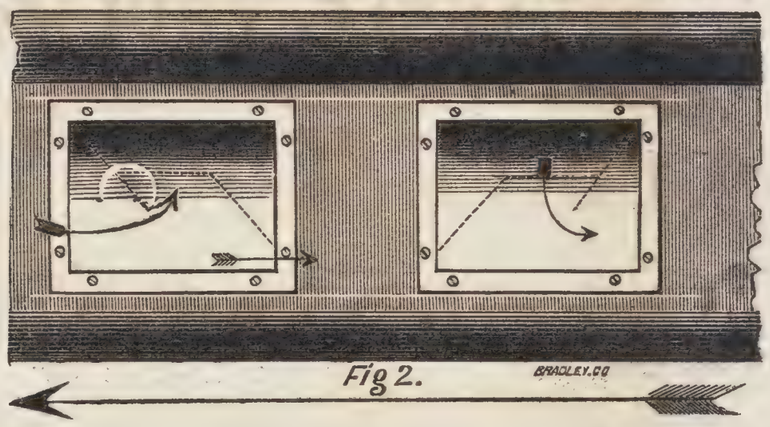


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is a ways in readiness, and runs itself independent of all employees.

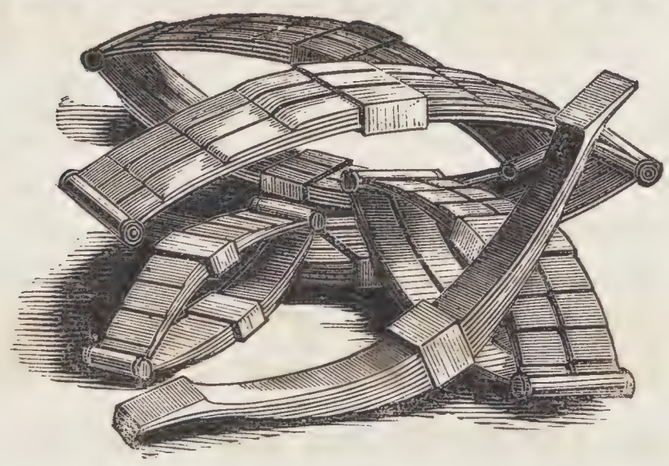
H. D. CARROLL & CO., Springfield, Mass.,

Proprietors and Manufacturers.

ROBERT HITCHCOCK, Inventor.

HALF AND FULL CAST-STEEL

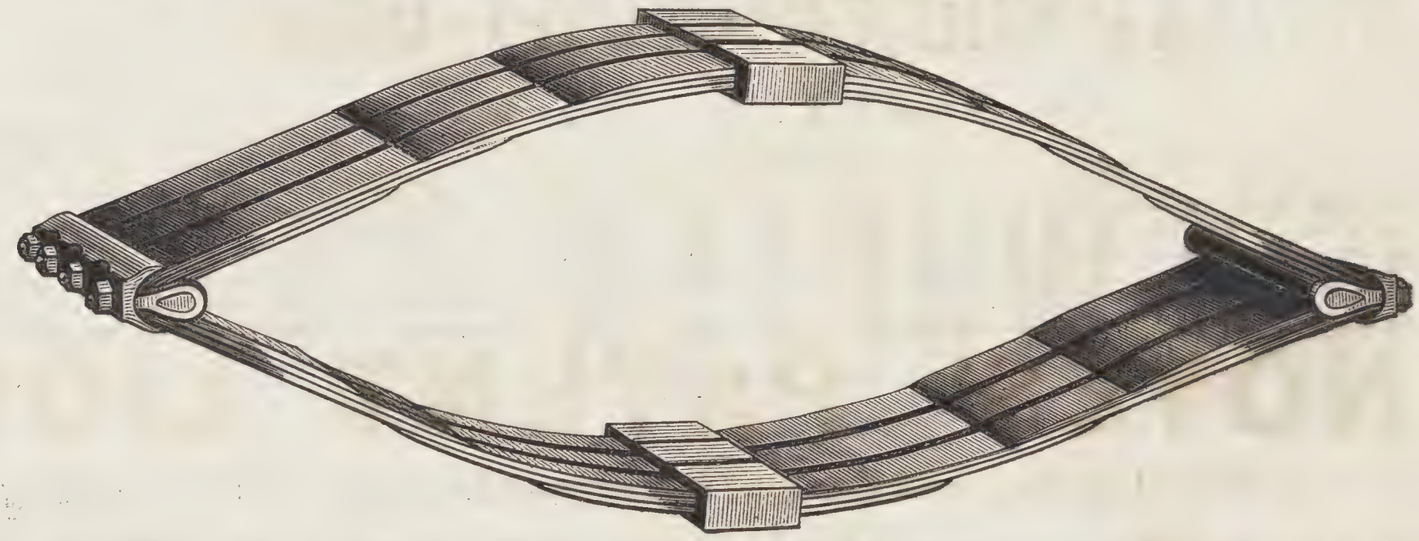
ELLIPTIC SPRINGS.



Our own manufacture; light, extra tempered, and made of best material. Equal to any in the market.

CLIFF'S PATENT ELLIPTIC CAR-SPRING,

For Freight or Passenger Service.



A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

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DELAWARE CAR WORKS.

[Working Capacity, 1000 Men.]

MANUFACTURERS OF PASSENGER, SLEEPING, CITY, BAGGAGE & FREIGHT CARS

JACKSON & SHARP COMPANY.

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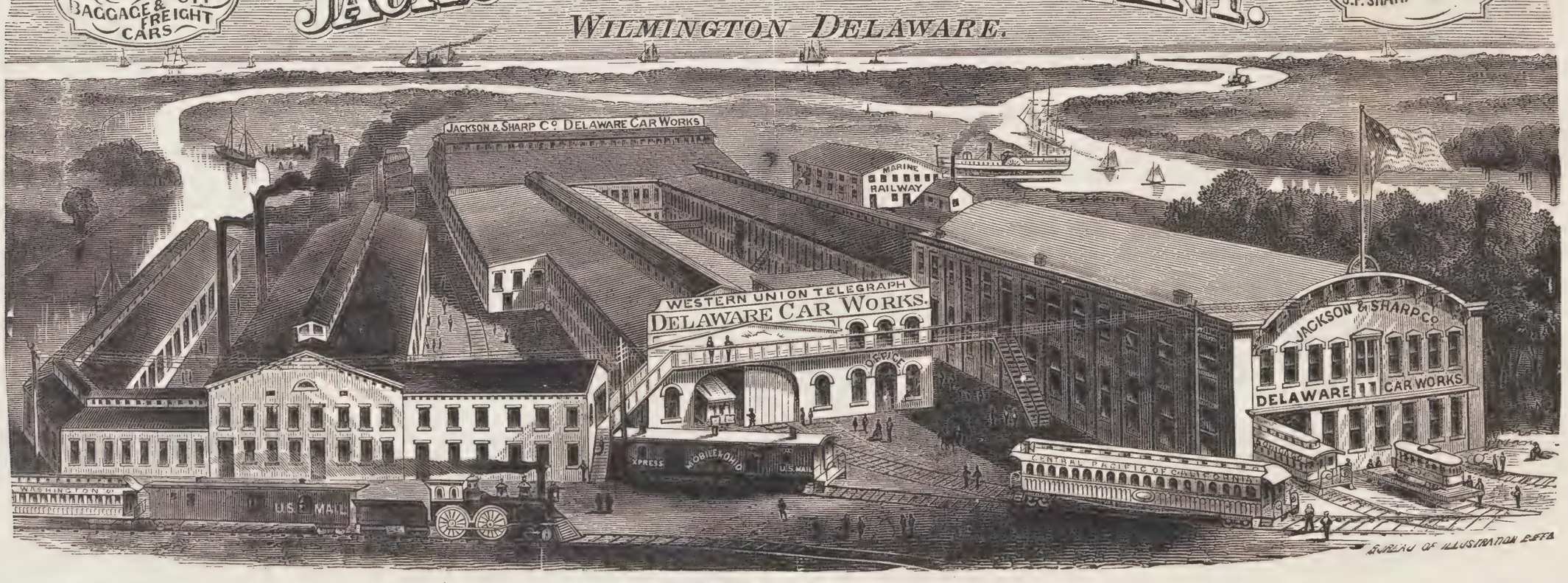


Manufacturers of Sleeping, Saloon, Drawing-Room, Passenger, and Freight Cars of Every Gauge.

STEAM GOVERNORS WITHOUT COST,

WHEN THEIR SUPERIORITY OVER ALL OTHERS AS THE MOST PERFECT, RELIABLE AND ECONOMICAL

STEAM GOVERNOR IN THE WORLD

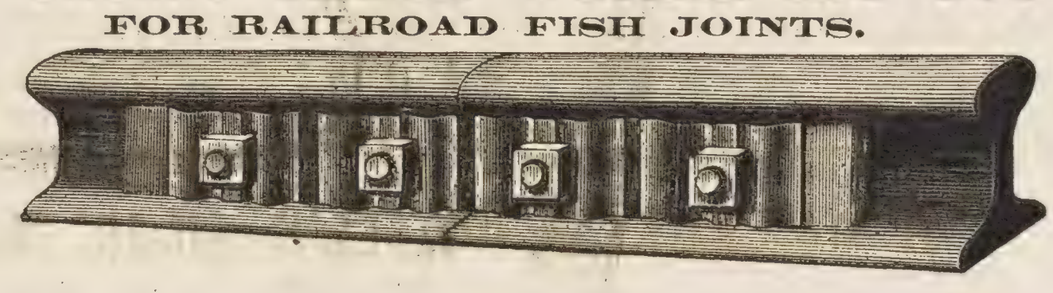
IS NOT FULLY ESTABLISHED BY ACTUAL TEST.

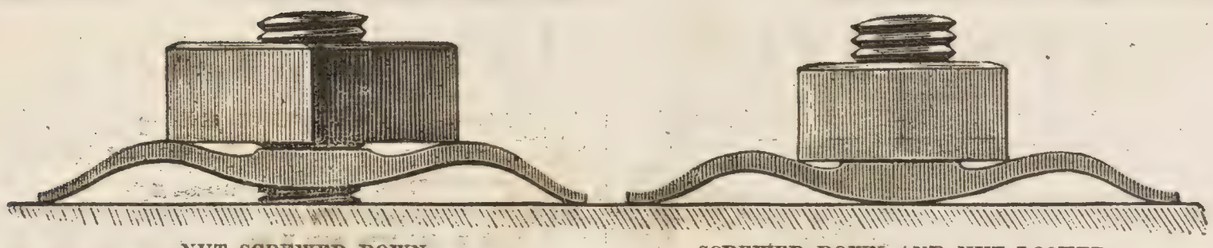
They differ from all others both in principle and operation, and insure any desired uniform speed under all variations of load or boiler pressure. Largely in use by the U. S. Government at Treasury Department, State and Custom Houses, Navy Yards, &c.; also, by leading Manufacturing Establishments, Rolling, Saw and Paper Mills, Tanneries, &c., throughout the country, where the most positive and uniform speed is required. Address, for descriptive circular of reference, &c.,

HUNTOON GOVERNOR Co., Lawrence, Mass.

MILLER'S PATENT ELASTIC WASHER AND NUT LOCK,

FOR RAILROAD FISH JOINTS.

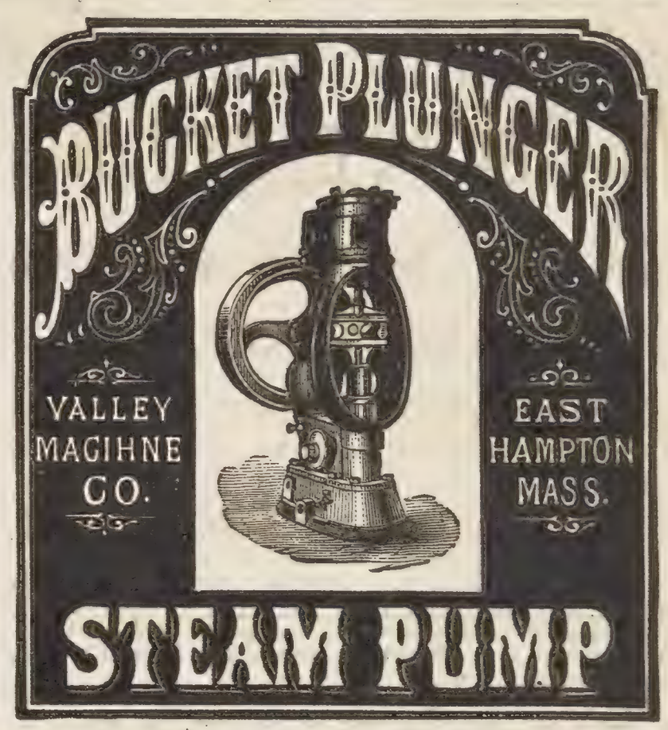




NUT SCREWED DOWN. SCREWED DOWN AND NUT LOCKED.

These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

Address *SWEETS MFG. CO., Syracuse, N. Y.*



CARS FOR SALE.

The Ohio Falls Car Company,

Jeffersonville, Ind.,

Offer for Sale

FORTY

Centre-Dumping Coal-Cars.

For description of which see wood-cut and specifications, page 163. These cars are new and will be sold cheap for cash or on a liberal credit.

NOYES' PATENT LIQUID PACKING.

For Cooling Railroad Car and Steamboat Journals, and Bearings of all kinds, and for Mixing with other Oils.

The attention of those who are running heavy journals is respectfully invited to the above Liquid Cooler. It has been successfully used for upward of two years, and is constantly growing in favor, as its merits become known, and we are confident that practical men can not fail of being convinced that our preparation deserves their candid attention. What we claim for it is:

That it will Cool a Hot Journal when in Motion,

and extinguish the flame when the box is on fire; that its use will, in a great measure, prevent the occurrence of a hot journal, and save the expense, delays, and annoyances incident thereto; that it will eliminate the heat from a journal at a temperature greatly below the point required to melt the babbitt, preventing an accumulation of heat, and by a timely application save it from destruction; that its non-inflammable elements (where waste is used) permeate the waste and prevent its taking fire; that it keeps the journal smooth and polished, preventing unnecessary friction; that its combination is based upon true scientific principles, which renders it impossible to fail in its results, and is

The only Preparation that will Cool a Hot Journal

while it is in motion, as attested by certificates below; that one thorough application on a hot journal will do more execution in cooling than the constant application of water for half an hour, besides doing it evenly and without loss of time.

Every Railroad or Steamboat

should have a can of the Liquid Packing on board, with the directions for its use pasted upon it, and thus always have at hand the means of effectually cooling a hot journal, and thereby avoid the expense, danger, and trouble from this cause.

FOR RAILROADS, AN EXCELLENT AND DURABLE LUBRICATOR

can also be made by combining with the Liquid Packing certain quantities of mineral oil, according to the season of the year in which it is to be used, as set forth in the directions. The combination produces a soft, heavy body, that is very essential in hot weather, an element that is lacking in mineral oil. The Liquid also keeps oil sweet, by preventing oxidation, and its value is greatly enhanced by the additional body which it acquires; and considering the increased durability, it will be found a matter of considerable economy to combine the Liquid and mineral oil together. In cold weather, the combination is not so essential, but it will always be found economical to combine a small quantity of the Liquid with the mineral oil which is generally used upon railroads.

Where Black oil is used as a lubricator exclusively, mixed as directed, especially in warm weather, it will be found a great improvement, and fully equal to lard oil, making a considerable percentage of saving in cost, lessening the liability of hot boxes, and animal oil can be entirely discarded, even in warm weather, and as good results obtained, with less expense, as where all animal oil is used. We manufacture suitable cans for using the LIQUID PACKING. Send for circulars containing full description and instruction for use.

WHAT RAILROAD MEN SAY OF IT.

BOSTON, LOWELL AND NASHUA R. R. SUPERINTENDENT'S OFFICE,
P. NOYES, AGENT, BOSTON, April 13. 1874.

Dear Sir: We have been using your LIQUID PACKING, and consider it one of the best articles for cooling off hot boxes that we have ever been acquainted with. All of our trains are supplied with a can of it. JOHN B. WINSLOW, *Supt.*

PERSON NOYES, Esq.,
Agent Belt and Leather Stuffing Co. EAST CAMBRIDGE, MASS., March 4, 1874.

Dear Sir:—In reply to your inquiry in regard to LIQUID PACKING, allow me to say:

I have just sent in a requisition for three barrels, which I trust you have received before this. I will only say in recommending it, that it is the best article I have ever used, and our conductors and engineers all indorse my sentiments.

I have ordered eighteen more cans, which I think will meet your approbation. I intend to have one on every train, and on long trains two, and having them made with inch nozzles, and a cap attached by chain, to prevent thickening; also, a packing iron about fourteen inches long, attached to a slot in the can, to be used in stirring up the LIQUID, and also for drawing the waste out on the front side, and crowding it in on the back side, before putting the packing in. This little packing iron I find very essential, as it is always at hand, and will prevent delay in searching for a suitable article in times of emergency. Yours truly,

JOHN F. CROCKETT, *M. M. Boston, Lowell, and Nashua R. R.*

PERSON NOYES, Esq.:
Agent Belt and Leather Stuffing Co., CHICAGO, Dec. 10, 1873.

Dear Sir:—The barrel LIQUID PACKING sent on trial is approved, and you will please send us five barrels more. Yours, H. I. HIGGINS, *Purchasing Agent C. B. and Q. R. R.*

CHICAGO, March 23, 1874.

P. NOYES, AGENT: Please forward to C. B. & Q. R. R., and send bill of same to this office, eight barrels of LIQUID PACKING same as purchased of you before, and send as soon as possible.
H. I. HIGGINS, *Purchasing Agent Quincy Railroad.*

CHICAGO, ILL., May 7, 1874.

AGENT BELT AND LEATHER STUFFING CO.:
Dear Sir: You will please forward to the C. B. and Q. R.R. ten barrels Liquid Packing.
H. I. HIGGINS, *Purchasing Agent C. B. and Q. R.R.*

MR. NOYES: FITCHBURG, MASS., Aug. 20, 1872.

Dear Sir:—I have used your LIQUID PACKING for the past four months, and am perfectly well satisfied that it is the most effectual article ever in use for the purpose claimed. I have just ordered another barrel. If all railroad companies would adopt your LIQUID COOLER, I think they would find a saving of nearly 20 per cent, when used with mineral or black oil, according to your directions. JACOB MARSH, *Master Car Builder Troy and Greenfield R. R.*

MR. P. NOYES: SALEM, MASS., AUG. 7, 1872.

Dear Sir:—I have been using your LIQUID PACKING for cooling car journals, for some time past, and have been well pleased with it. I have had occasion to use it a number of times, under Pullman Cars, and it has been a complete remedy in every case of hot journals.

Every train should be provided with it, as it is a saving of time and expense in the running of trains, provided it is applied and cared for according to directions for using.
J. P. SOMERBY, *M. C. B. of Eastern Railroad.*

P. NOYES, Esq.: ALBANY, Nov. 1, 1872.

Dear Sir:—I received the barrel of LIQUID PACKING you sent me for trial, and gave it out to our most experienced conductors, to use according to directions. Below please find their report;

"WE, the undersigned, Freight Conductors on the Eastern Division of the N. Y. C. & H. R. R. R., have used the LIQUID PACKING furnished by Mr. Jones, and find that when we arrive at a station with a hot journal, the LIQUID PACKING cools it sufficiently by the time we arrive at the next station to use the Black Oil, and then have no trouble in getting through with it. It is the best we ever used."—R. H. FISHER, A. W. GETMANS, R. H. HEATH, WM. HESS, Conductors E. Div., N. Y. C. R. R. I. FERGUSON, Conductor H. R. R. R.
JOSEPH JONES, *M. M., N. Y. C. & H. R. R. R., E. Div.*

Send for a Barrel. No charge unless it does all we state.

Manufactured by the Belt and Leather Stuffing Co.,

47 INDIA STREET, BOSTON.

Sold by Vose, Dinsmore & Co., New-York.

RAWLINS' METALLIC PAINT.

Warranted Fire and Water Proof.

Will cover more surface and outwear any paint manufactured.

Owing to its extreme fineness, every particle is utilized. No sediment settles to the bottom, and when applied, it produces a smooth, glossy surface. With less oil to the pound, this paint will go over twice the space of other so-called "Mineral" paint, and produces a more intense color. It is entirely free from dirt, slate, or any impurities, being manufactured out of the best Red Hematite Iron Ore, and pulverized finer than any paint that has heretofore been manufactured by a process peculiar to this Company.

This paint is not affected by water or extremes of cold and heat, and is peculiarly adapted for tin roofs. It will also stand hard usage, and for railroad cars or wagons can not be excelled. It has been used by the Union Pacific Railroad Company, and by whom it is pronounced superior to any quality they have ever used.

Address

Rawlins' Metallic Paint Company,

RAWLINS, WYOMING.

ALBERT C. MCNAIRY, Pres't. JOHN COON, Sec. HARVEY T. CLAFLEN, Supt.
HENRY M. CLAFLEN, Vice-Pres't and Treas. SIMEON SHELDON, Engineer.

The Cleveland Bridge and Car Works,

[Established in 1851.]

THE McNAIRY & CLAFLEN MANUFACTURING COMPANY, Proprietors.

BUILDERS OF

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EITHER OF IRON OR WOOD.

Pneumatic and Screw-pile Sub-structures, Railroad Passenger and Freight Cars, Street Railroad Cars.

☞ Post's Patent Iron and Combination Bridges; Howe Truss Bridges, with Patent Iron Clamps; Street Railroad Cars, with Higley's Patent Running Gear and Brake.

Roofs, Turn-Tables, and Transfer-Tables.

OFFICES—Waring Block, cor. Bank and St. Clair Streets.

WORKS—On Watson, Hamilton, and Lake Streets.

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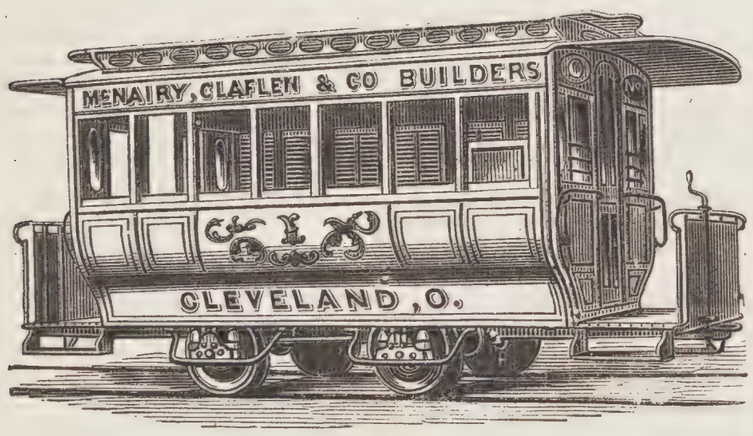
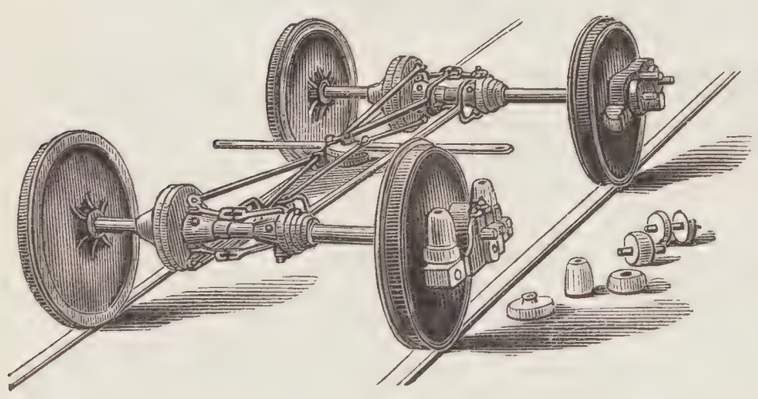


The Lightest Running, Easiest Riding, Most Durable, and Most Economical Street Car in Use.



Higley's Patent Street Car Running-Gear and Brake.

Made and Sold by THE MCNAIRY & CLAFLEN MANUFACTURING COMPANY, **Cleveland, Ohio.**

IRON CLAD PAINT.

Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
D. & M. RY. O. & M. RY.	C. C. C. & I. RY.
The K. P. R. R. CO.	L. C. & L. R. R
T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
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GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

Brinckerhoff, Turner & Co.,

Manufacturers and Dealers in

COTTON DUCK,

For Car Covering and Car Seats,

14 to 150 inches wide. Also Agents

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A full supply, all Widths and Colors, always in Stock.

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Make a ***Specialty of Freight Car Forgings*** and ***Castings*** delivered to Shops. Also ***Locomotive Cylinders, Frogs and Switches.*** Address,

THOS. N. MILLER, President.

THE BUFFALO CAR COMPANY,

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ARE NOW PREPARED TO RECEIVE ORDERS FOR ALL KINDS OF

FREIGHT CARS.

These works, recently completed, are furnished with the very latest and best Machinery, and are prepared to furnish the better qualities of work with promptness.

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Hydraulic Jacks and Punches,

BOILER TUBE EXPANDERS,

AND DIRECT-ACTING STEAM HAMMERS.

Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

WALL'S MAGIC RENOVATOR.

For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

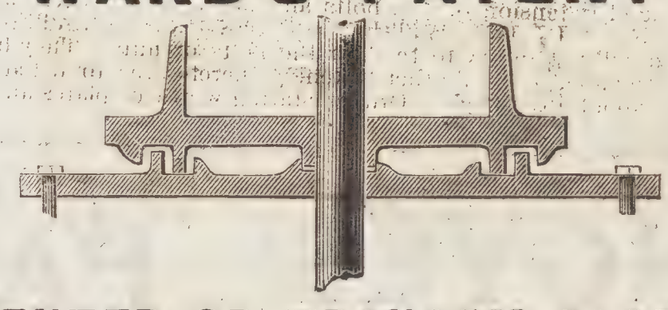
Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

JAMES J. WALL,

P. O. Box 45 Tremont, Westchester Co., N. Y.

WARD'S PATENT



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With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
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ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

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built in the most approved manner and of the best material. Orders respectfully solicited. Address,

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A. W. LOPER, Ass't Sup't St. Louis, Iron Mountain & S. R.R.
WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
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The "EMPIRE," a Fan-Blowing PORTABLE FORGE,

FOR SHOP USE.

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WITHOUT BELTS OR BELLOWS.

It is more **Easily Worked,** gives a **Better Blast,** and is the **Cheapest** forge made, and

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W. P. KELLOGG & CO., Troy, N. Y.

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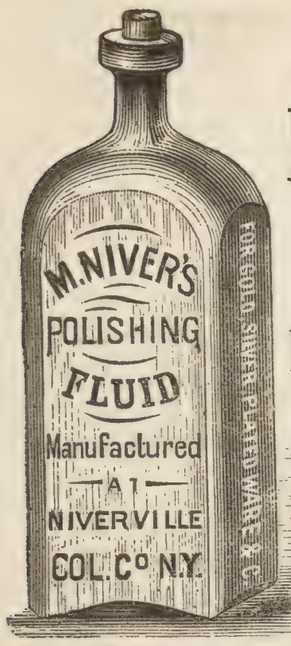
Also, Curry Combs, Boring Machines, and Cooley's Whip Racks, etc., etc.



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COMPANY,

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VOSE, DINSMORE & CO.

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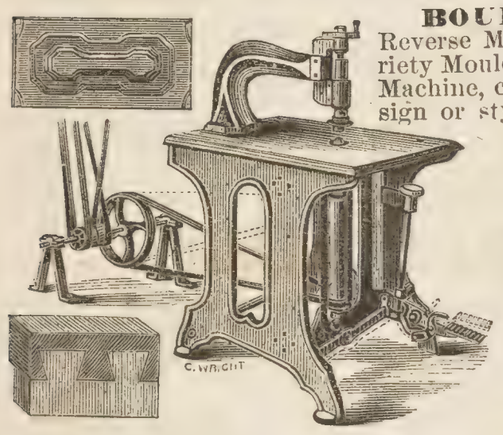

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Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

Routes and grooves for Windows, Stairs, Cars, Bridges, etc., etc.

Moulds, fine Bracket and general Scroll Work. It is a first-class Shaper and Moulder, Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.

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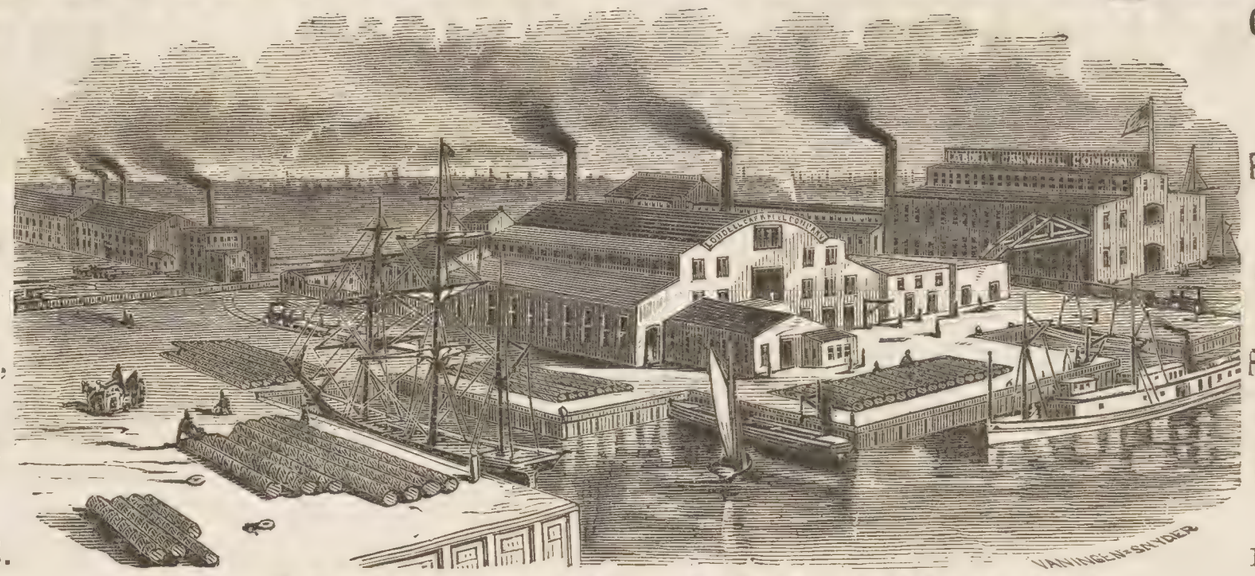
Lobdell Car-Wheel Company.

SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



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WILMINGTON, DELAWARE.

GEO. G. LOBDELL, PRES'T. W. W. LOBDELL, SEC'Y. P. N. BRENNAN, TREAS.

THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

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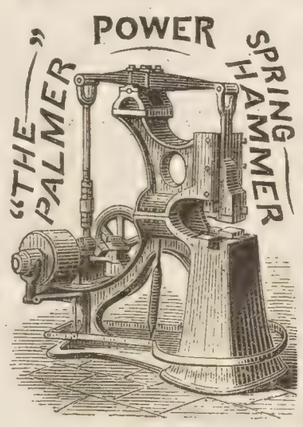

Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

S. C. FORSAITH & CO.,

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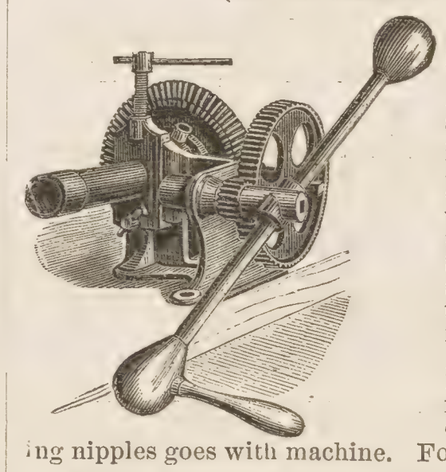
Who are also Builders of the

Abbe Bolt-Heading Machine.

CHASE'S

Pipe-Cutting and Threading Machine.

(W. D. CHASE'S PATENT.)



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine. For Sale by

MORRIS, TASKER & CO., Philadelphia, New-York, and Boston.

Address.

The Chase Manufacturing Co.,

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Send for Circular.

THE HARLAN & HOLLINGSWORTH CO.,

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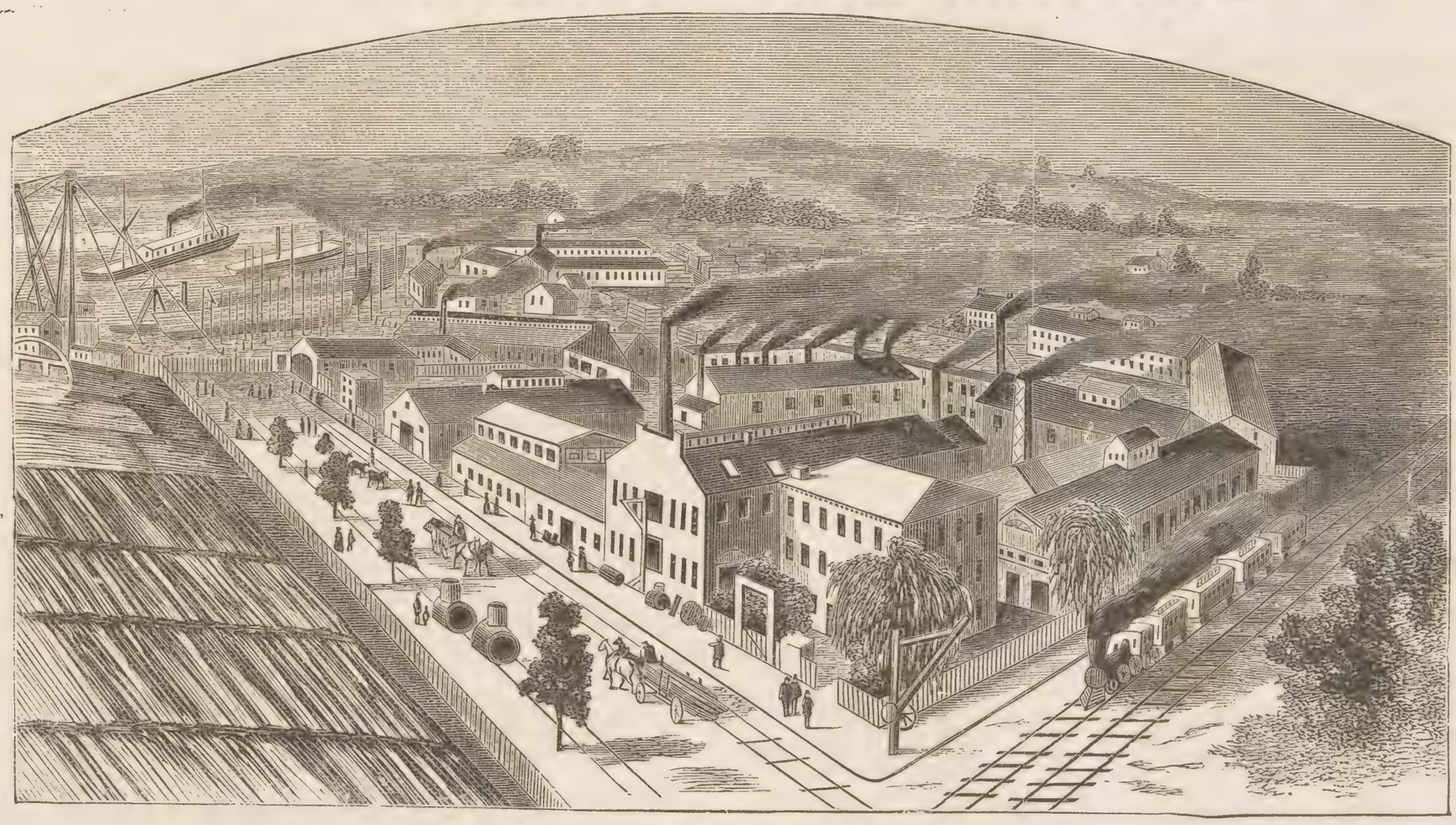

BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

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MURPHY & CO.,

Varnish Makers.

SPECIAL ATTENTION PAID TO

RAILWAY REQUIREMENTS.

Outside Finishing,	$5.50	Engine,	$5.00
Outside Rubbing,	4.50	Coach-makers' Japan,	2.00
Inside Car,	4.50	Black Japan,	1.50

These goods are now in use on the principal Railways of the country, and have had a success never before reached by any others. For Railway uses they are **Superior** to the imported.

PRINCIPAL WORKS:

238 McWhorter Street,

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MURPHY & CO., 119 Larrabee St., Chicago.

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THE PULSOMETER,

APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

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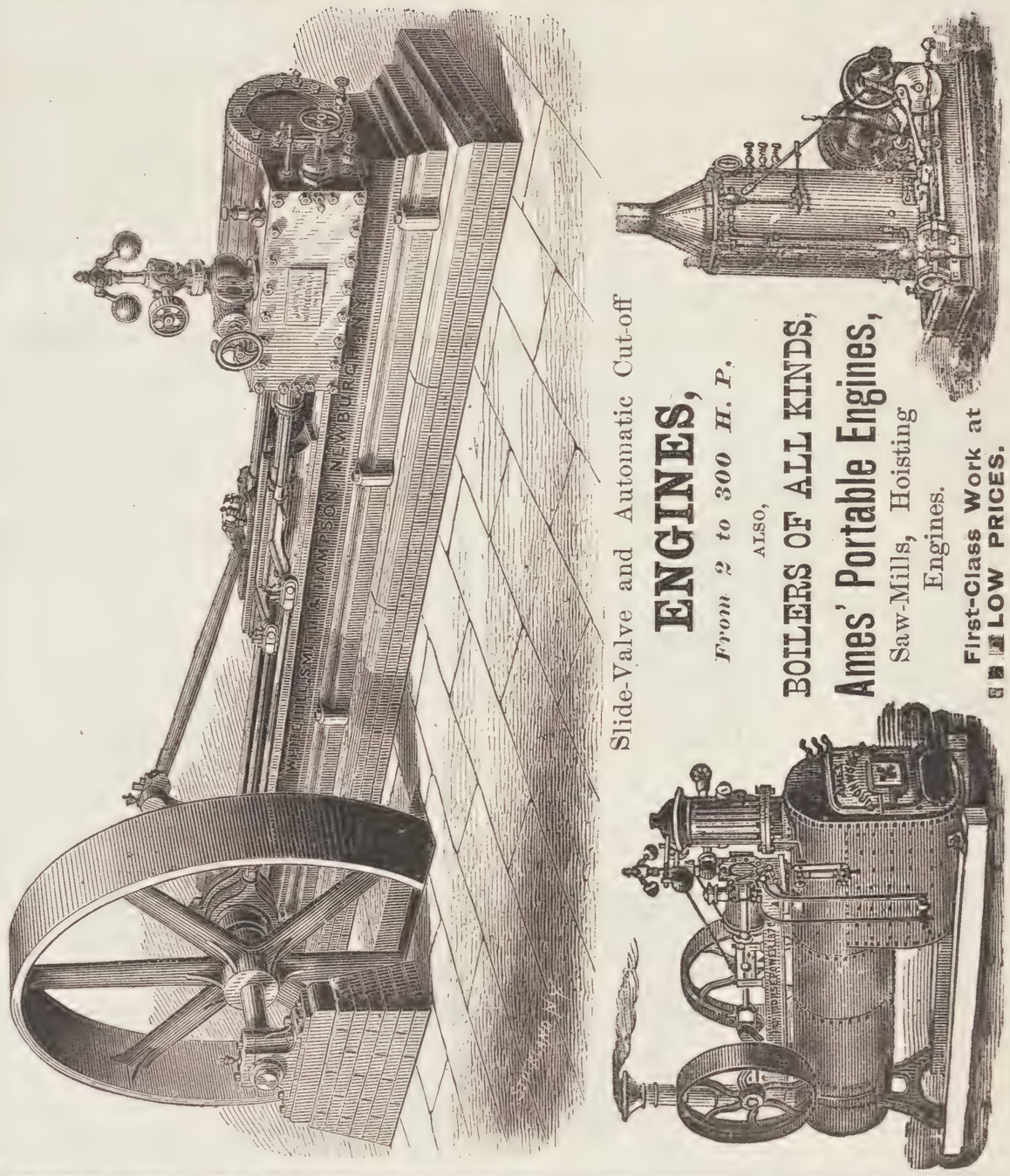

THE

Atlantic White Lead

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LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

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INDIANA CAR COMPANY,

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FREIGHT CARS,

(Capacity, Six Cars per day,)

JOHN McMILLAN, Manager. Cambridge City, Ind.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. V. No. 11. | NOVEMBER, 1874. | One Dollar per Annum. Single Copies, 10 Cents.

The Government Boiler Experiments.

THE only interest the practical engineer can have in these experiments is to verify or otherwise his calculations on the strength of material put in a given form. Here his interest ends. Practical men know that above all other things pertaining to steam and steam-engines, the boiler is subject to so many contingencies that no laboratory experiments can be of much value.

When the boiler has only to supply a given amount of steam, flowing freely and regularly through an orifice, and this steam is made from pure water, the most favorable circumstances for steam-production exist. But this is seldom the case; the water, as a rule, is impure, making scale, or perhaps the water is salt, which is worse.

Then, if the boiler supplies a steam-engine, the flow of steam is intermittent, producing what is known as *pulsation*, the sides of the boiler pulsating or springing out and in at every stroke of the engine, this motion tending to the destruction of the boiler, and being aggravated by the modern practice of carrying high steam and cutting off short. This pulsation of course seeks the weakest point; and there always is one such point.

The water may be what is called pure, forming no incrustation, yet contain an acid that imperceptibly erodes the iron; and should there be another metal, like copper or brass, in contact with the iron, the boiler may be destroyed by galvanic action. This latter is most dangerous, because insidious and not generally apprehended, reducing a portion of the boiler to a thinness that is only revealed when it gives out.

Foaming takes place sometimes, and requires skill and experience to manage it.

A most pernicious practice is to use an open heater, by which all the oil or tallow used is pumped into the boiler, its action being in the highest degree deleterious, and, with a fire-box boiler, dangerous.

Another and too common practice is the introduction of the feed-water into the lowest part of the boiler, especially if it is of the locomotive type or a fire-box boiler. The writer of this article examined two boilers of the locomotive type, rated at forty-five horse-power each. The boilers had been but six months at work before they were ruined and ruptured in their fire-boxes by introducing the feed-water in the leg below the fire-grate. There was no fault of construction or material. The fire-boxes were made of three-eighth best Pennsylvania iron, and thoroughly stayed with three-quarter screw-stays at the angles of each; yet in six months the plates of the fire-boxes were destroyed.

Another fruitful source of destruction of boilers is small leaks in rivets or seams—nothing apparently when considered with reference to loss of steam or water, yet corrosion takes place, which, if not arrested, eats away the plate, and finally a patch is required.

Another cause of premature destruction of boilers is the inequality in heat to which a boiler by its construction or setting, perhaps both, is subjected, expanding one part while the other remains comparatively cool.

Another and very common mode of destroying boilers is to blow them off hot with a hot furnace of brick around them, and then fill them with cold water.

Another is the forcing of a boiler to double its legitimate capacity.

Unfortunately, too many boilers are placed in care of men wholly incompetent; if they can shovel coal and get steam enough for the time being, they and their employers are too often satisfied.

With all these sources of danger, though a boiler may have withstood such tests as may be recommended by the commission conducting the Sandy Hook experiments, it may be asked, What security have we? The competent engineer will affirm that the only safety lies in vigilance; that boilers ought to be often inspected by an expert; and that his directions should be followed to the letter. He finds safety-valves overloaded, steam-gauges incorrect, and other appliances, ostensibly for safety, not safe at all; sheets blistered or corroded when all was thought to be right and safe. The boiler was undoubtedly safe *once*, but not now. If an explosion takes place, is it mysterious?

With a good safety-valve, good gauge-cocks, a correct steam-gauge verified four times a year by an expert of the Hartford Steam-Boiler Inspection and Insurance Company, with thorough inspection of the boiler by the same expert, and a reasonably competent and careful attendant, there need be little fear of explosions.

It was, we think, the eminent scientist, Sir William Thomson, who asserted that the safety in the use of boilers depends not upon their strength, but upon our knowledge of their condition, which enables us to guard against overtaxing them.—*American Artisan.*

Impracticable Inventors.

"IT is one thing to construct a machine on paper, but a very different affair to make it go," remarked a friend to us recently, as he ruefully regarded a roll of elaborate drawings, which represented the fruitless labor of a year or so of his earlier life. "If friction and gravity were only out of the way, what a great inventor I should be!" and with this sententious observation, the plans were reconsigned to their dusty shelf.

It certainly does seem an extremely difficult matter to convince mankind in general that the same operation, when it is plainly impracticable by simple means, through its variance with some natural law, is just as impossible with the most elaborate combination of machinery. Moreover, as a corollary to the above proposition, and as a general rule, if we set about a piece of work wrongly and make errors (through negligence, through forgetfulness, or through ignorance) in its course, losing sight of the pitfalls in our road while regarding only the brightness of the goal, it is equally certain that the grand result we seek will not be reached. This neglect of detail, impracticability of design, in brief, appears to be one of the commonest difficulties in which inventors are prone to involve themselves; and the reason is that they become so completely imbued with the single grand idea that they fail to see any thing of apparently minor importance, utterly oblivious of the fact that perfect parts alone constitute a perfect whole.

It is related that Brunel, the great English engineer, was constantly visited by inventors desirous of submitting their designs to his expert judgment. Although frequently wasting time of the utmost value, in the examination of impracticable schemes, he would patiently listen to the description, and then point out the fallacies in the chimerical projects. An enthusiastic individual came to him one day with a plan for sweeping chimneys; it would totally obviate the cruel employment of the small boys who were sent up the flues; it was simply a broom—a mere broom—which, worked from above, swept every minute crack perfectly.

"Excellent," gravely said Brunel, "but you have not told me how the rope is to be got to the top."

"Why, nothing is more simple," replied the sanguine inventor, "of course a boy will go up with it first."

At another time, the same celebrated engineer was interrupted in his labors by an Irish gentleman, who was burning to tell him all about a portable hood, which was to be stowed away under an open carriage in fine weather, ready for immediate use in case of a storm.

"But you can not stow away such an enormous thing as that in so small a space," objected Brunel.

"Certainly not," ejaculated the unabashed inventor, "it's not that that I mean to do. It's at home the thing is to be left when the weather is fine; of course it won't be wanted then, you know."

It is this looking only at results, more especially when coupled with ignorance, not merely of principles but of what others have already proved useless, that has led many an inventor to despair, oft-times to ruin.

A simple incident in point came to our notice recently in the course of our weekly stroll through the American Institute Fair. Among the entries for exhibition was that of a rotary engine, which in due time was brought to the building by its constructor; and the inventor, with the aid of the proper officials, proceeded to set it up. The inventor—an old man whose dress and general appearance betokened a hard struggle with the world in days past—grew quite garrulous over his pet, and told how he had worked upon it for years, how he had spent every cent to get it built, and how he had now brought it from the far West to show the Eastern people what it could do. Then the blood would crimson his cheeks and his

eyes glisten, while he would stop and gaze fondly on the insensate metal. When the placing of the machine was completed, the throttle was opened. Two turns were made, then another slow one, and then every thing stopped. A second trial did no better. It was the first practical test, and the machine had never before existed except on paper. Then the inventor, with trembling fingers, moved a wheel here, a nut there; for some time he worked, but in the end he threw down his tools, and sinking despairingly into a seat, buried his face in his hands, and great tears stole slowly down his wrinkled cheeks. He saw that his treacherous fondling could never be made to run, and yet for three days he returned again and again to its side, wistfully gazing at it as if he hoped to gain some inspiration which would, after all, set every thing right. But none came; none could come, for the very principle of the machine had long ago been exploded. Finally, heart-broken with disappointment, the old man started alone for his far-off home—not altogether penniless, however, for before he left, his worthless engine was purchased from him at a good price by one upon whose labors in the same path fortune had abundantly smiled. Then others contributed their mites, and a sufficient sum was collected to enable the man to pay his passage home, without touching the little capital derived from the sale of his machine. That was a genuine and a noble charity, and while the names of the generous givers are known to but few, the deed is one which an all-wise Providence will not allow to pass unrewarded.—*Scientific American.*

A French Locomotive.

AMONG the locomotive engines exhibited at the Vienna exposition, was one built by the Cruesot Works (located a few miles from the city of Paris), and intended for the Midi railway. It is claimed to be one of the best locomotives at present in use, and excited much interest among the mechanical engineers who visited the exhibition. It is designed for heavy grades; its weight, empty, is 47 tons; size of cylinders, 18 x 24 inches; 8 driving-wheels, 4 feet in diameter, coupled; frame of 1¼ inch slab steel, polished, and stayed to the boiler with a bottom hinge-joint to allow the axle-box to work in the horn-blocks sideways when curving, giving no strain on the boiler or frame; the axle-boxes are made of wrought-iron, stamped out in a solid block; the engine-springs are hung with an elbow-link, in place of lifting on the equalizing lever; they draw at the end, giving a more sensitive equalization of the engine, the lever never being liable to break-wear in the pin; the journal bearings are of gun-metal, which is found to be the cheapest on account of its great durability. The cylinders are outside, with steel connecting and piston-rods; the piston-heads are cast-iron and solid, with two grooves ¾ inch wide by ⅞ deep, to admit the cast-iron rings; the rings are turned the exact size of the cylinder, and are hammered on the inside till they are ½-inch spring, the required amount of spring to keep tight. This is the best and much the cheapest ring, costing but half that of brass rings and requiring no looking after. Piston-rings with springs are continually getting out of order, keeping an experienced mechanic to set them up, as the danger of cutting the cylinder is great, by too tight setting up, and when too slack they cause an unnecessary consumption of fuel, as well as preventing the engine from taking a full load. The valves are of gun-metal, **D** shape, with the back of **D** cut out; a counter-plate being set inside the steam-chest, covered with a ring round the outer part of the valve, preventing in this way all pressure on the back of the valve, and thus saving it from wear, the counter-plate saving the wear of the motion, which is very important. The ordinary link-motion is used, the two eccentrics being fastened to a return counter-crank on the end of the main crank-pin, which is 6½ inches in diameter in order to sustain the extra weight. The wheels are of wrought-iron, with steel tires 3 inches thick, put on with a slight taper; journals 8 inches in diameter by 10 long; no bolts to fasten on except two ⅞ ones; the reversing lever being connected with a screw, can be unshipped to reverse the engine with only the lever, if desired; there are no pumps, the Gifford injector being used on nearly all locomotives in Europe—two on each engine. The delivery is 2¾ inches round, the check-valve chambers having a shut-off cock between the boiler and the valve. A thin plate of steel is placed 1½ inches from the delivery hole between the tubes and the shell at the top, and open at the bottom as much as the tubes will allow; this is to prevent the cold water striking the tubes as it enters the boilers; or, rather, to prevent as much as possible the great combat between the cold and hot water at this point, which is of much injury to the tubes, as well as causing the formation of sediment upon them at this point, where corrosion is so great when using lime water. Boiler made of steel, ⅜ inch thick; inside fire-box of copper, ⅝ inch; flue-sheet ¾ inch; length of box, 7 feet, by 3 feet 6 inches deep, 4 feet grate bars; straight wrought-iron fire-box stays intended for coal-burning; tubes of brass, 9 feet long, 2 inches diameter; steel ferrules in fire-box ⅛ inch thick, inside and out; tubes put in with a small hydraulic press, thus preventing any hammering about the tubes as well as the tube-sheet.

The shell of boiler is made with butt joints with no lap of sheet. This is much stronger and prevents corrosion of the seams, being also better for circulation of the water; the steam-pipes of copper, 4 inches in diameter; exhaust-pipes also of copper, oblong shape, curling out of the way of tubes, also 4 x 7½ inches inside; nozzles 2 inches below the bottom of the top of smoke-box, leaving the tubes all clear to get at; smoke-stack 3 feet 6 inches long, 16 inside, straight; no netting, a grating being placed inside of the smoke-box, just over the top row of the tubes, being made so that it can be closed or opened by the door with a lever from the cab. This saves the use of netting in the stack, and keeps the cinders inside until well burnt to ashes. The nozzles of exhaust-pipe are also made so that they can be opened or closed from the cab. This is a good plan, as bad coal is sometimes used; in that case it is necessary to have the nozzles smaller, and on a road that is up and down grade, the nozzles can be varied to suit them; also, a pair of light trap-valves in the exhaust-pipe, closing themselves as the steam is shut off, thus preventing coal-dust from getting into the cylinders, which is very destructive to both valves and pistons, as well as to the seats and cylinders. The throttle is in the **T**-pipe in smoke-box; the dry pipe running into the dome close to the top, with a perforated pipe, 12 x 20 inches long; this being immediately over the mouth of the steam-pipe, prevents the water getting into the pipe; the safety-valves are balanced by a solid weight consisting of a round bar of cast-iron inside of a tube fastened to the top of the fire-box. This does away with any spring-balance or springs of any kind. The water connection between engine and tender is made with a ball-joint with a brass tube telescoping into back of feed-pipe. This does away with rubber hose, which often prevents the pumps from working.—*English Paper.*

An English Workman in America.

THE London *Engineering* is publishing a series of letters from an English mechanic in this country. In one of these the writer says: "The height of an American workman's ambition is to discard scribing-blocks, surface-plates, compasses, and squares, by substituting guides that hold the work in its proper position and guide the cutting-tool, and by substituting machine for hand labor, the former being more uniform and exact, which is an object of the first importance. The time spent by an English mechanic in learning to line out work, chip, chase threads and chuck, is employed by an American in learning the simplest form and the readiest method of making the aforesaid guides, termed fixtures, to do such work by machinery, which is the quickest and most exact method of working, and which insures uniformity; and one can scarcely credit the extent to which the system is carried. Take, as an example, a pair of locomotive cylinders: the fitter will take a pair, bored and planed, and without putting a line on them, will drill, tap, put in the studs, put on the covers, steam-chests, valves, cylinder-cocks, etc., all bolted together true, steam-tight, and complete, ready to bolt to the smoke-box in two days. All the holes are drilled and tapped through a fixture; neither square, callipers, compasses, scriber, nor chisel is used, nor is a single hole filed, nay, the fitter is not even supplied with a round file at all. The mode of cutting out the ports is well worthy particular mention. A fixture is bolted over the steam-chest face, having the false ports in it wider and longer than the ports to be cut; in these false ports fits a sliding die, having a hole through it—a hole the width of the port intended to be cut. In the hole through this die fits a reamer, cut an inch from the end which is rounded, the cutting edges running round the end; the reamer is put in a Bement & Dougherty drilling-machine, and wound down, cutting its way through the end of the port, then wound along, cutting the sides of the port both at once; the ports are thus cut perfectly true, straight, and smooth, and all alike to a hair. A pair of cylinders can have the ports cut out by this plan in one hour. The price paid for getting up a pair of cylinders is £5, paying your own laborer; I have finished complete three pairs in a week. Even the motion-bars are all erected complete, with a fixture to the cylinder-covers, with distance-blocks, motion-blocks, all fitted complete, leaving nothing to be done in the erecting-shop but bolt the bracket to the stay. The frames are got up in a similar manner: axle-boxes all fitted and bored, every hole drilled complete, all ready to bolt up before entering the erecting-shop, at a cost of eighteen dollars, or say £3. Permit me to illustrate one of the advantages of this system. Suppose a man to be tapping a hole for a cylinder-stud; he keeps putting his square to see if it is being tapped straight, which depen ls on his skill and carefulness; and even then there are always some holes not tapped true, in which case the cover has to be put on and off, and the holes marked where the studs bind; and then they have to be filed out. Now, by tapping them with a long drill through a guide, the workman *can not* tap them otherwise than true; it does not depend on his skill, and it does not matter what cover he puts on, it will fit, and a new one can be supplied at any time with the absolute certainty that it will fit without any fitting or adjusting.

"Revolving cutters are much in use here; the work is held in a fixture, in the required position, and passed between the cutters, which are held between distance-pieces made of tube, which being of a standard length, insures the uniformity of the work; there is no skill required; bolt the work in the fixture, screw up the nut which jams the cutters against the distance-tubes; and if you face off that work, it must be true, and the right size: it don't depend on any one's measurement or any workman's skill; so long as the tube is, of course, made to its proper length, one skillful workman can cut off a great many distance-tubes, etc., and thus not much skillful labor is required. All holes are bored with standard bits and reamers; one skillful workman can keep a great many in order, and then, so long as the workman merely uses the bit, the holes are sure to be of one size and true. Now, take a screwing-machine as another illustration; here there are no adjustable dies used, as is frequently the case in England. A chuck is used containing four screwing-tools like chasers, which adjust themselves; they will not cut the wrong size, and they cut a clean, true thread full at one cut. Threads cut in the lathe are finished complete with the screw-tool without chasing; and uniformity of size, without requiring much skill, is obtained by fixing a small adjustable screw and nut to

the slide-rest, so that, after the first thread is cut and your nut adjusted, you have only to cut the thread until the rest jams against the nut, and the screws must be one size, and you *can not* cut them too small. In connection with lathe-tools, I must not omit universal chucks that take hold of any thing round or square, and chuck it dead-true without setting; this is a perfect boon to a machine-shop, and in connection with twist-drills is the very quickest and truest method of drilling that has yet been devised. In short, the Americans display most extraordinary ingenuity in getting up tools and devices to do the work without requiring skill or exactitude from the workman, which requires a great deal more knowledge and intelligence than learning to be a skillful handler of tools, and accomplishes the desired object more efficiently and systematically. The remark has sometimes been made to me, 'Oh! I saw that at So-and-So's in England;' well, even so, the difference is this: There are in England some shops that adopt more or less similar methods of working; there are none in America that do not adopt them. I never saw a scroll or universal chuck in England. I never saw an American shop without them. (I omitted to state, in connection with milling-machines, that one establishment has three hundred of them.) The variety of machines and fixtures is a great educating medium of instruction; hence the American, in designing, works with an extensive idea of mechanical movements, and casting aside all that has been done, endeavors to institute something new and superior."

THE thirteen steam canal-boats put into service on the New-York and Erie Canal appear to be doing their work satisfactorily. One of them reached Buffalo from New-York a few days ago, with a load of merchandise, in six days, seventeen hours. This is considered good time. The Baxter Company have contracted for ten more boats of the same pattern—a fact which shows that they are regarded as an improvement over the horse-boats. The freight rates are very low, but notwithstanding this, it is said the new boats make money.

IT sometimes happens that, by centring, etc., the interior diameter of a tire becomes so much too large that it will not fit the wheel. Such defects have been corrected by a German machinist, by heating the tire red hot, and holding it in that condition half immersed in cold water, until cold; then heating again red hot, and immersing the other half in the same way. In the first operation, the unimmersed hot portion must contract with the portion rapidly cooled, with a corresponding condensation of material, and consequent permanent diminution of diameter; and in the second operation, a similar effect is produced on the other half. By these two operations an interior diameter of 34 inches can be reduced ¼ inch, and by four operations ½ an inch. The method given is not confined to tires, an instance being given where a ring of Bessemer steel, to be used as a flange-ring, had been entirely misshaped by an inexperienced workman, and was drawn into shape by heating 15 times, and cooling different portions.

Centre-Dumping Coal-Car.

THE engraving represents a style of car manufactured by the Ohio Falls Car Company, at Jeffersonville, Ind. The detailed specifications are as follows:

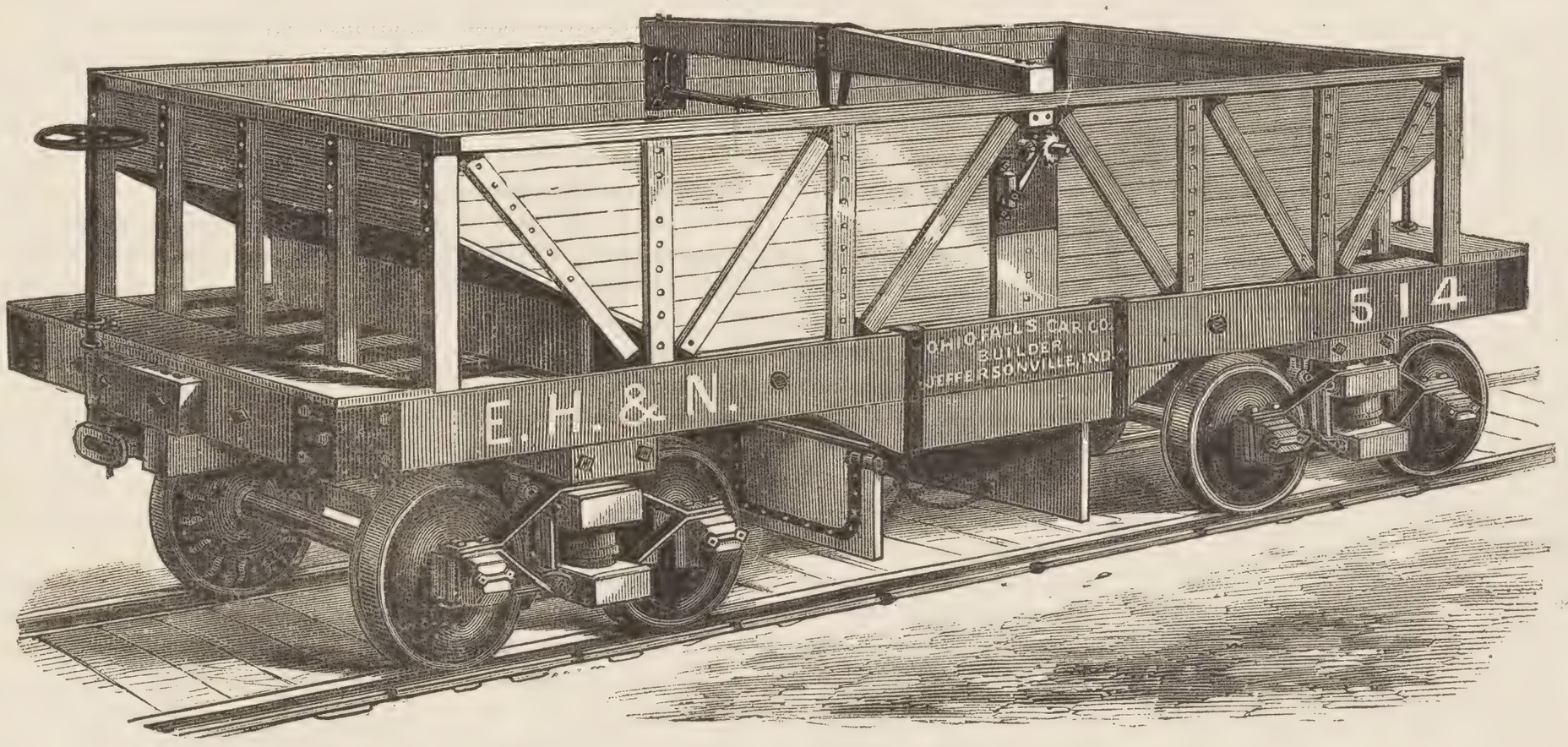
Frame of oak, 21 feet long, and 8 feet wide outside of sills. Coal-box, 18 feet 5 inches long, and 7 feet 5 inches wide on inside. Depth at ends, 1 foot 2½ inches; at centre, 4 feet 6½ inches. Size of opening in bottom, 7 feet 4½ inches by 3 feet. From top of rail to top of coal-box, 7 feet 7 inches.

Two side sills, 3½ by 8½; one centre sill, 6½ by 8½; four short intermediate sills, 2½ by 8½; four draft timbers, 3¾ by 8½; end sills, 7 by 8½; body-transoms, 5 by 13.

Floor of car faced with No. 10 iron; floor of drop faced with No. 4 iron. Cast-iron draw-bars, with 6 by 6 by 1¾ hole volute buffers.

All braces rest in cast-iron shoes. Frame thoroughly ironed throughout, and very strong and stiff. Siding secured to posts by bolts. Body and trucks thoroughly painted.

Trucks, Cleveland pattern. Rubber-centre spiral bolster-springs, in four cases, 10 spirals in each case,



or 40 to a car. Centre-hung brakes on one truck. Compromise double-plate wheels of superior quality. Gauge, 4 feet 8½ inches.

The company above named has a number of these cars on hand and for sale. They are entirely new, and constructed of the best material. The reader is referred to advertisement on page iii.

A Word for Brakemen.

BRAKEMEN are probably subjected to more numerited fault-finding than any other class of train-hands, not even excepting baggage-men. If the car is too cold, the blame is laid upon the brakeman; if it is too hot, he is equally to blame, no matter whether the excess of heat is due to an unadjustable stove-register or the natural temperature of the atmosphere. Railway officials are in the habit of saying that any car attachment designed to promote the comfort of passengers must have more brains than a brakeman, or it won't do. Doubtless the brakeman has many sins to answer for, but it does not follow that he is not often sinned against both by his employers and the public. His wages are too small to secure any very great mechanical ability, experience, or judgment. He has probably, in the great majority of cases, had no regular training in any special vocation, or he would be engaged in other and better positions. Most of the brakemen on passenger-trains are young men of this class who enter upon their duties without any previous instruction. A person of this description procures a position on a train, and finds the cars provided with stoves the like of which he never saw before. A few brief verbal directions are given him in regard to their management, or perhaps no directions at all. The weather is cold, and he feels bound to keep the car warm. He 'fires up" without much discretion, and the car is overheated; the passengers abuse him for his stupidity in not knowing how to manage the stove, so as to keep the temperature just right. Or perhaps a heavy, full-blooded passenger complains of being too warm; the dampers are closed to cool him off, the result of which is a complaint from an emaciated, thin-blooded invalid, that the car is too cold, and the perplexed brakeman, in order to exonerate himself, quotes one complaint to silence the other.

Now, it is more than likely that if the stove had been properly managed, no cause for either complaint would have arisen, and it has not been properly managed through sheer ignorance and lack of instruction as to its capacity. We know of an instance in which a through car, equipped with new lighting and heating fixtures, was placed in charge of a young man, at a moment's notice, who had no previous knowledge of such fixtures, nor any directions as to their management. Things did not, of course, work very smoothly, but it was not, in any proper sense, the fault of the brakeman. Take a road, for example, that has always used candles for lighting its cars. A change is suddenly made, and a new style of lamps introduced. They are a puzzle, at first, to the brakeman, and their management a mystery past finding out. Little by little he gets an idea of their working, but at considerable expense in the way of broken chimneys, spoiled burners, poor lights, and general grumbling and vexation. He masters the situation at last, but might have done so much sooner with the aid of a little judicious and careful instruction at the start. On some roads, directions are posted up in the cars, defining the duties of brakemen—not only for their own guidance, but to keep passengers from expecting too much. This is a step in the right direction. An important and indispensable service can not be satisfactorily performed without the requisite capacity on the part of those who undertake it. Brakemen, instead of being regarded as scape-goats, and selected as such, should have a modicum of native shrewdness to begin with, and this should be improved upon by some preliminary instruction before entering on their duties.

THE primary colors are blue, red, and yellow. The secondaries, produced by a combination of them, are purple, of blue and red; green, of blue and yellow; orange, of red and yellow. Blue is contrasted by red and yellow, or orange; red is contrasted by blue and yellow, or green; yellow is contrasted by blue and red, or purple. Orange, or red and yellow, is contrasted by blue; green, or blue and yellow, is contrasted by red; purple, or blue and red, is contrasted by yellow.

WITH few exceptions, says a veteran observer, illiterate and half-educated persons use more "big words" than people of thorough education. It is a very common but a very egregious mistake to suppose that long words are more genteel than short ones—just as the same sort of people imagine high colors and flashy figures improve the style of dress.

Lubrication of Railway Rolling-Stock.

BY J. M. BLANCHARD.

THE best possible lubricators, and the best methods of applying the same, are subjects which have been to a great extent ignored by writers upon railway rolling-stock; and yet they are matters of such paramount importance, as to justify an article devoted to their special consideration. The present custom of railroad companies is to appoint a purchasing agent, whose duty it is to provide material of all kinds, including what is required for the lubrication of machinery, etc. These agents, in the selection of oils for this purpose, are quite likely to give their orders to parties who will sell the cheapest, and this would very properly be regarded as sound economy if oils of the same name were always alike in quality. This, however, is not the case. It must be admitted that the questions as to what is the best lubricant, and the best methods of its application, are difficult ones to determine; yet it is apparent that the difficulty in the first case is owing to inadequate means of testing the various kinds of oils. To verify this statement, it is important to determine the nature of the service required of them as lubricants.

It is easy to say in general terms that the thing to be done is to lubricate the frictional parts, such as the journals and the sliding portions of the machinery; but to designate the best material for doing it—all the conditions and circumstances being taken into the account—is another and far more difficult matter. It is evident that the best lubricant for the purpose is a substance that will adhere to the surfaces with the greater degree of tenacity, and that will form the most perfect and permanent fibre or coating of absolutely lubricating material upon the parts in contact; for it must be remembered that any material, in order to act as such, must keep the surfaces coated, and that to do this, it must pass between the journal and the bearing which rests upon it, at all times, under all velocities, and without reference to the amount of weight that may be resting upon any given area of frictional surface. Were it a fact that the weight upon the journals, and the velocity of the frictional surfaces, were constant, much of the trouble of determining the quality of a lubricant would be removed; but such is not the fact. The journals of a car have at times only the weight of the car-body to sustain, while at other times they have to bear the weight of the body and a full load, amounting in some cases to from five to six thousand pounds to each journal.

Again, the journals of the engines bear a different weight in proportion to the area of journal-surface, and they are subjected to great differences in space, which of course gives great differences to the velocity with which its journals, as well as those of the car, rotate. It would seem to follow that the best kind of lubricator for a car when loaded and moving, say at a velocity of eight miles per hour, would not be the best for such car when unloaded and moving at twenty miles per hour; because a lubricant of such specific gravity as would be carried between the rolling surfaces with the light load and high speed, would be excluded from such surfaces by the greater load. The tests, therefore, which are made to determine the quality of oil, in so far as relates to its specific gravity, are no tests of its adaptability to the purposes to which it is to be applied; as a composition of soap and water may be made, which, tested by the hydrometer, will be found to be of the same specific gravity as a certain kind of oil which is known to be a good lubricant; and yet such composition would be found to be a very indifferent lubricator, far inferior to the oil which is its equal in specific gravity, and of course it would not lubricate at all, were it not for the fact that there is in it the small quantity of greasy or fatty matter contained in the soap. The reason why the soap and water is not a good lubricator is, that too great a percentage of the ingredients are not in themselves lubricants; and this is equally true of oils, they being composed of different substances, some of which are, and some of which are not, in themselves lubricants. If we take an ordinary oil-lamp, and fill it with any of our lubricating oils, and raise the wick to such a height as to cause what is usually denominated smoke, we shall find that a large amount of nearly pure carbon may be collected from such smoke, which shows that there is present an amount of material which is not in and of itself a good lubricant, and yet it must be remembered that this carbon has had its effect in determining the specific gravity of the oil.

It having been shown that one substance, which is not in itself a lubricant, can be used to increase the specific gravity of oil, it will not be denied that there are others which may be used for the same purpose. It is well known that native petroleum is a mixture of a great number of hydro-carbons, compounds of hydrogen and carbon, which are intimately related to its specific gravity. The average composition of Pennsylvania petroleum is,

Gasoline,	above 65°,	Baumé's test	10.
Naphtha,	59° to 65°,	" "	10.
Lubricating oil,	below 36°,	" "	76.
Coke		" "	4.

We therefore have in this material 24 per cent of what may be termed non-lubricating material, aside from what of solid carbon it contains, which is a very large proportion of the remaining 76 per cent; and it would be erroneous to suppose that all of this foreign substance would be driven off by the process of refining.

What then shall be done? Shall we conclude that there is no way of determining what is the best lubricant for engines and cars? Oh, no. But the quality, or rather qualities—for more than one will be needed—should be determined for each of our leading roads, by an intelligent person appointed for that especial purpose. He should familiarize himself with the subject, with the different admixtures of oil, and with the requirements of the different machines and cars in use; then a series of careful experiments should be begun, and conducted with reference to the lubricating qualities of the oil alone, leaving all theories about specific gravity and all else alone. After each test had been extended through a sufficient length of time to establish a fact with reference to a given quality of oil, a mixture of oils should be made and the experiments repeated. Such tests, with reference to engines, passenger-cars, and freight-cars, would probably develop the following facts: First, for those parts of the engines where the frictional surfaces slide upon each other, one kind of oil would be needed, and another kind for those portions where the surfaces rotate one within the other; for passenger-cars, or cars which carry comparatively light loads and run at high rates of speed, an oil of light specific gravity, but containing the largest possible percentage of the lubricating quality, would be required; while for freight-cars, a "heavier oil," as it is termed, would be preferable; and the writer is clearly of the opinion that if the tests are what they should be, it will be found that on similar cars carrying equal loads, but having different lengths or diameters of journals, different qualities of oil will be found to give widely different results. Should any of our leading railroads be induced to try the experiments suggested, there can be no doubt that the money spent would yield larger returns than any equal sum ever expended by them; and yet there would remain another important thing for them to do, which would be to ascertain the most economical method of applying the lubricant; for when the question of economy is considered, the amount used is of quite as much importance as the quality, and it will be found that, with proper appliances, the amount actually necessary to be used will be largely dependent on the quality.

I believe that the usual allowance of oil to each engine for one hundred miles run, is about two quarts. If I am correct in this, the cost is probably about 50 or 60 cents, or it may be more, and it will, of course, be claimed that this amount is not an extravagant one; but if this is admitted, it must at the same time be claimed that it is 75 per cent more than it ought to be, for there can be no doubt that with the adoption of a proper method of applying the lubricant to the frictional parts of an engine, one pint would be all that would be required per one hundred miles run, that quantity being probably more than is actually consumed in traveling that distance, the rest being allowed to run away.

That this estimate is not an erroneous one is believed to be clearly proven by the fact that our best passenger-cars run that distance with a less proportionate quantity of oil, and yet we are compelled to say that in them a very large amount is wasted by being absorbed by the journal-box packing. The fibrous material used for packing will absorb about a pint of oil, and every time it is removed a like quantity of oil is wasted, so that this apparently economical plan is really a very expensive one; for if a car can be run a thousand miles with the pint of oil actually utilized, it can be run twice the distance with the oil actually absorbed and thrown away with the waste each time it is renewed in the journal-box.

What has been said about experimenting with oils, will apply equally to fuel, and to the materials used in constructing cars and engines; and it is a matter of surprise that railroads should be operated, as they are and have been, on a basis of so much uncertainty in these respects. It is not to be questioned that until quite recently the operations of the mechanical departments of our railroads have been without that demonstration which alone can give certainty; or, to state it more plainly, we have gone on guessing that certain practices were about right without any positive knowledge on the subject. For instance, if I ask a practical railroad man what will be the difference in the amount of power required to move a loaded car, the journals of which are 2½ by 3½ inches, and one having 3½ by 6-inch journals, the weight in the latter case being the same as in the former, his answer is, "I do not think there would be much difference, but I have never tested the matter to such an extent as to know." Again, if I ask at what rate of speed an engine must be run in order to exert the greatest amount of force upon the train, the answer is, "I do not know, never having applied a dynamometer for the purpose of ascertaining." If he is asked what are the relative practical values of the different kinds of wood as fuel, the answer will be just what casual observation has taught him, and not what carefully conducted experiments have determined.

The writer once had the pleasure of meeting in convention a large number of practical railroad men, where the relative values of a ton of coal and a cord of wood for fuel were discussed, and a committee was appointed to investigate and report upon the subject. The question was not asked, What are we to understand by a cord of wood, and by a ton of coal? neither was the committee instructed as to what was meant, and it was impossible to restrain the thought that that committee had imposed upon it one of the hardest tasks ever undertaken, because of the fact that the wood would vary so much according to its kind, and the coal, if taken from our American mines, would contain from sixty-five to ninety-three per cent of carbon. So this committee would have a great deal of guessing to do, and the better they were at that method of arriving at conclusions, the more correct their opinions would be.

The writer is not disposed to dwell upon this subject, but candor compels him to say that, in his opinion, this guessing method has been pursued long enough, and that it should now give way to some plan which will enable us to ascertain actual facts, and which can only be done, as is believed, by establishing an experimental shop, and testing the material used under circumstances as nearly as possible like those to which it is actually subjected in practice. If the leading railroad men of the country would join in erecting a suitable building, and in supplying it with suitable apparatus and devices for testing the

quality of oil and all the other materials consumed in operating their roads, the expense to each one would be small, and there can be no doubt that such an arrangement would prove highly remunerative; for if ten cents can be saved in the cost of lubricating each engine and car run one hundred miles, and an equal amount in the reduction of the cost of packing each car one hundred miles, and an equal or greater amount by selecting the proper material for the fire-boxes and flues of engines—such selection having reference to the transmission of heat, as well as to durability—they certainly would be justified in appropriating the required funds for the purpose.

Railway Equipment Trust.

THE Philadelphia *Railroad and Mining Register* says that a number of gentlemen of that and other cities of the State, engaged in the manufacture of car-wheels, axles and cars, have formed an association under the name of the "Railway Equipment Trust of Pennsylvania," for the purpose of constructing cars to be leased to railroad companies at a rental which, after paying an interest of eight per cent upon the cost of the cars, will leave a surplus applicable to the payment of such cost, and by this process the railroad companies leasing gradually become the owners of the cars. The capital of this association has been fixed at $3,000,000, and contracts have about been closed for the construction of one thousand cars at a cost of $600 per car. The Pennsylvania Railroad Company, with the view of meeting the demands made upon them by the managers of the various coal properties seeking outlets over their lines, as well as the requirements of the properties owned by themselves, propose to lease these cars from the association. The ordinary car service allowed to connecting lines will be appropriated to pay the interest or rental of eight per cent, and the balance of that fund will be applied from time to time to extinguish the principal, so that within the period of a few years the Pennsylvania Railroad Company, out of the savings thus made, expect to own the whole of the cars they take in this form. One good effect of this car association will be to enable the Pennsylvania Railroad Company to supply coal-cars to operators on the lines of their several roads, and make productive properties that are now producing little, if any thing, and it will enable the company to do this without increasing its floating debt; indeed, it will relieve the existing pressure in that regard to the extent of the loan used.

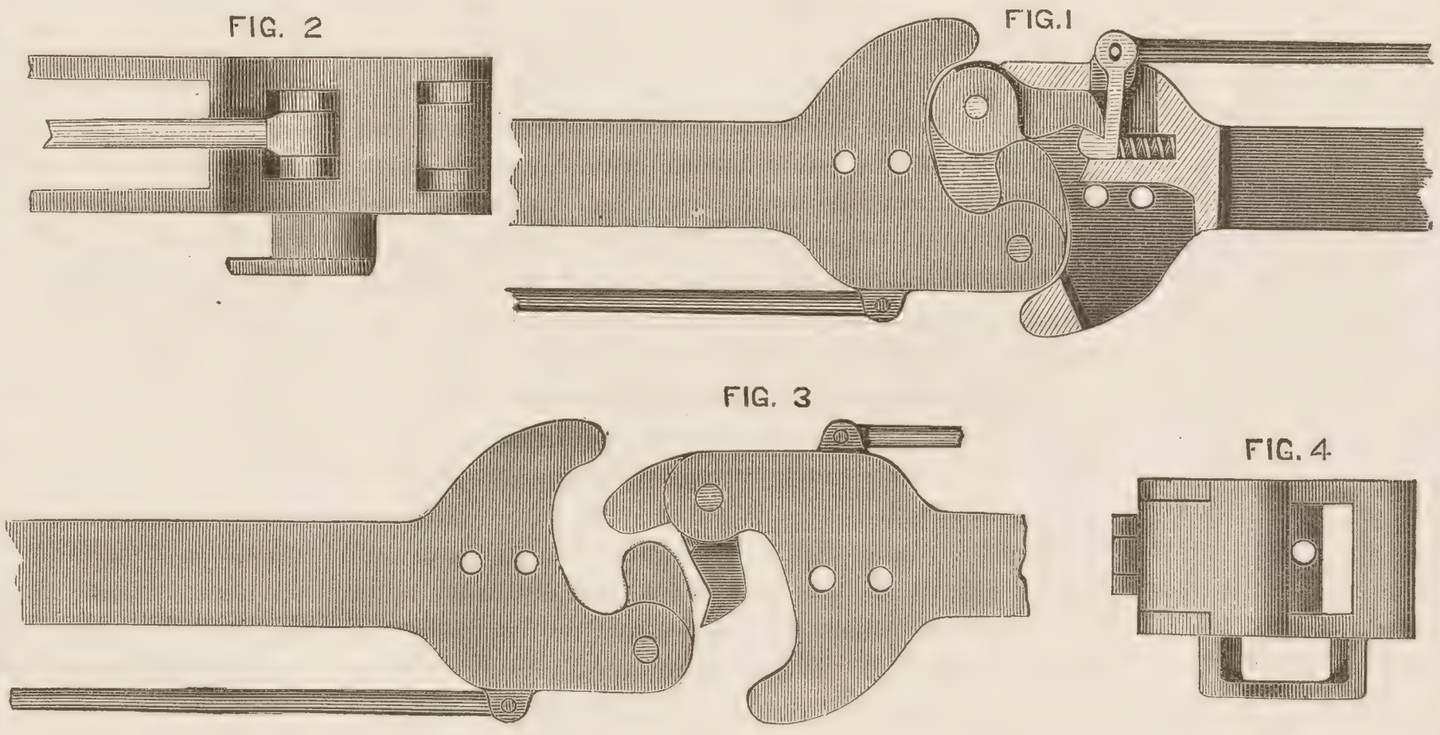
M. GIFFARD, of injector fame, has invented a method of fitting railway carriages which eliminates oscillation. The carriage is suspended by powerful springs at each end; and at the trials recently made in the presence of some members of the French Association for the Advancement of Science, the carriage was found to be so steady that reading and writing could be easily carried on. It will shortly be exhibited to the English public.

THE Connecticut River Railroad has adopted the Vacuum brake, and has endeavored to remedy almost its only objection, the hissing noise. The company have attached a triple box to the cab just where the brake-pipe comes through. The steam expelled from the pipes enters the inner box, from which it slowly escapes into the middle one, and at last reaches the outside. The effect is to completely deaden the noise of putting on the brake, and the invention bids fair to be extensively adopted.

The Janney Car-Coupler.

THIS method of coupling cars, of which Mr. E. H. Janney, of Alexandria, Va., is the inventor, has attracted the attention of railroad men to such an extent as to secure its adoption on a number of roads. Considering the great number of coupling devices in use, this is a very favorable indication of its merits. It is a combined coupler and buffer, the construction being such as to prevent any lateral or longitudinal play of the cars, and thus secure greater steadiness to the train.

Fig. 1 is a horizontal section, showing the interior arrangement as it appears looking down from the platform; Fig. 2 is a side-view; Fig. 3, the position of the parts when on the point of coupling; and Fig. 4 an end-view, with the pocket below, in which a link is carried to connect with ordinary draw-heads. Its construction and operation may be briefly described as follows: The inventor has followed nature, taking for his model the spinal vertebræ. The coupler, when closed, resembles a section of the spinal column. It affords sufficient motion in all directions, without loss of distance. Having no lateral or longitudinal play, it prevents the jarring and jamming of the cars, so damaging to the rolling stock and so unpleasant to passengers. There is simply a supple knuckle-joint formed between the platforms, effectually preventing the swinging of the platforms in opposite directions, and making a steadier train than by any other coupler in use. It is much simpler and stronger than other couplers, adjusts itself to the unevenness of the track or difference in height of cars, does away with links and pins, and never pulls at an angle. It is of course automatic in its action, and its use incurs no risk of life or limb. It can be coupled and uncoupled on the shortest curves with the greatest facility, and in case the cars leave the track the coupling will remain.



THE JANNEY CAR-COUPLER.

It is in use on the Virginia Midland and Great Southern; Washington and Ohio; Pittsburg, Ft. Wayne and Chicago; Western and Atlantic; Atlanta and West Point, and other roads, and has proved equal to all that is claimed for it by the inventor and patentee. The Janney Car-Coupling Company, at Alexandria, Va., may be addressed for any information in regard to it.

An Improvement in Sleeping-Coaches.

MR. H. B. COBB, of Wilmington, Del., has recently shown us a model of what seems to be a very valuable improvement in the construction of seats and berths in sleeping-coaches, and of which he is the inventor. It consists in such a mechanical combination of the details of these two essentials of a sleeping-coach, as that either can be readily transformed into the other in such a way as to materially reduce both the cost and weight of the car as at present constructed, and also to entirely dispense with the sloping panels and the weight of bedding behind them, which are such objectionable features in a sleeping-coach during the day-time. The method by which this is accomplished can not be clearly understood in all its details without an inspection of the model, but a brief description may perhaps afford a tolerably correct idea of it.

During the day, when the bedding and berth-fixtures are all out of sight, there is nothing in the car to suggest the idea of its being used as a sleeping-coach, except perhaps the section seats facing each other in the usual way. The transformation is effected by first raising an upright piece or bulkhead from between the seat-backs by means of a sliding-spring. A connecting-rail, which rests during the day on the truss-plank, and apparently forming a part of it, is then put in place as a front support of the upper berth; the plush seat-backs, which are hinged at the top, are then lifted to a horizontal position and fastened to the front rail and car-side. This forms the upper berth. The lower one is then made by reversing the seats, the under sides of which are spring-mattresses. The remaining space is filled up by two additional sections of mattress, which, together with all the bedding except sheets and pillow-slips, are stowed under the seats. It must be borne in mind that the ordinary mattresses are not used, their place being supplied by Cobb's patent springs placed in the seat-backs and the under or reverse side of the seats, and forming, when in position, an easy and comfortable couch. The upper berths are separated from each other by dividing partitions surmounting the bulkheads. In a word, the arrangement is such that the whole structure of sleeping paraphernalia is made to disappear during the day and assume the form of the two ordinary seats, thus relieving the car of all obstruction or unnecessary weight over the windows. There are a number of other minor advantages apparent in the model which can be better understood by actual inspection. It is claimed by the inventor that as compared with a 12-section Pullman sleeper, "Plan 37," the application of his improvement will work a saving of $4000 in the first cost of a car, and 10,000 pounds in the weight—this last item, in consequence of a lighter framing being admissible for the car-side, by a removal of the upper berths and a concentration of their weight next the floor. He also claims that the present Pullman sleepers can be refitted with profit and advantage by substituting his improved plan for that now in use, the cost of doing it being small as compared with the obvious advantages.

THE work of changing the gauge of the Grand Trunk Railroad lines east of Montreal from 5 feet 6 inches to 4 feet 8½ inches, commenced September 26. Standard-gauge trains ran from Montreal to Portland September 28, the change having been completed on all the lines except the Rivière du Loup Division, which was not open until September 29. The lines changed were the main line from Quebec to Montreal, 297 miles; Quebec Branch, 96 miles; Rivière du Loup Division, 136 miles, and the Three Rivers Branch, 35 miles—in all, 564 miles of road. The change of the whole line to standard gauge is now complete.

A LATE number of the Pittsburg *Dispatch* says a special train was run between that city and Baltimore, over the Pittsburg and Connellsville Railroad, with the view of testing the capacity of the road for an increased rate of speed. The trial sufficiently proved that the company can run a train over their road from Baltimore to Pittsburg in ten hours, inclusive of all stoppages.

What was Done at the Master Car-Painters' Convention.

To the Editor of the National Car-Builder:

DEAR SIR: In response to the invitation contained in your late notice of the Master Car-Painters' Convention, in Buffalo, I will endeavor to furnish your readers with a brief review of the proceedings, in so far as they may be of general interest, extracting from the records some of the leading topics brought forward for discussion.

I shall not attempt to give in full the remarks of each member on the several questions, but simply an outline of them, which will be sufficient to show that the annual meetings of this Association are intended to promote the general interest of all master car-painters who may take part with us in such discussions, and which are intended to be of benefit to the corporations employing us, as well as to ourselves.

The several committees appointed at the previous annual meeting in Chicago, to furnish subjects for discussion, were present and introduced the different questions, giving their views thereon so far as their personal practice and experience extended; the question was then open for general remarks. This we find is the best means of securing information on any matter sought after by the members, and in no other way can the master painter acquire such valuable information.

The first, and what is considered of main importance, was the management of a shop. Many foremen fail for want of a proper discipline amongst their men, and a lack of judgment in their distribution on the several classes of work, according to their abilities, and unless there is a method or system of doing work, it can not be well done. We all have different ideas with regard to the management of a shop, and this being one of the objects of the organization, members have the benefit of each other's experience on this and all other questions brought before its meetings.

The priming of a car was discussed at great length, the foundation coats being considered of equal or more importance than any of the succeeding ones. After different views had been stated, and as many different minerals advocated as good for priming, it was generally agreed that a pure article of white-lead was superior to any other material. Some proferred to grind their own lead, believing it to be less adulterated in the dry state, while others found the best lead to be that prepared and ground by the manufacturers, as it is generally much finer, and has the benefit of age after being ground. All were ready to admit that good work could be done by either plan, and was being done in the different shops throughout the country.

The methods of detecting adulteration in lead and oil were clearly shown. The experienced painter can readily tell whether he has pure stock or not, but this did not in all cases remedy the evil. When paint-stock is received by the painter, he may report on its quality; it may be very inferior, but he is generally ordered to use it up on some work or other of a cheap class, and is promised a better quality on his next order. He has thus no choice but to use it on the best class of work when no other is on hand, and much good work is often spoiled in this way, the painter, of course, being the only one held responsible. White-lead, linseed-oil, and varnish are the three great protectors of the car, and according to the quality of each used will be the durability of the work.

A short discussion took place on the use of patent filling, many members present having tested it, both for outside and inside work. In but a few cases, however, had it given satisfaction, and then with but little saving of labor; but the great majority of those who had used it condemned its use on new work; in some cases, it was good for old cracked work, but every practical car-painter was fully competent to make his own filling in the shop, as he may want to apply it on any class of work, and he knows then what its ingredients are, and whether it will stand on the ground without cracking or scaling off.

The use of rough-stuff, which in by-gone years was deemed so necessary on the body of a car for producing a surface, was fast disappearing from the shop, and very few were now using it to any extent. A more economical and quicker plan for getting a surface was the scraping of the panel-work, which took but a few hours' time on a car, and the joints and plugs were not disturbed as by the old process, the water often penetrating the wood where great care was not taken in rubbing down the car. Shops that have abandoned the use of rough stuff are saving to the company fifty dollars on the painting of a first-class coach, and nothing has been taken from the wear or durability of the paint.

The use of raw and boiled linseed-oil was a subject which called forth an animated and interesting discussion. The question was, which of the two is the best to use on first-class car-work, and it was found that raw oil had the majority of advocates, although some gave it a slight boiling. The matter was not fully settled by the Convention, and many members returned to their shops fully determined to test the point for themselves before the next annual meeting.

The varnishing of a car properly, the time it should be allowed to stand over between coats, and the number of coats necessary on a good job, were ably and fully discussed. No special time was indicated between coats, as there was a great difference in the drying of shops, as well as in the drying of different varnishes, the painter himself being the best judge when the car is sufficiently hard for the next coat. The experience of car-painters is that a varnish which is a medium dryer, say 24 hours drying, out of dust, will give better satisfaction than one that will take less or require longer time. This, of course, is applicable only to the finishing coats; the rubbing or under coats should dry hard enough to stripe and ornament upon in five days.

The time required to paint a first-class day-coach varied, according to the views of different members, from six to twelve weeks; in many shops, there were times when but three weeks were given to paint the car from the time it left the wood-shop; one shop had got out two cars in twelve days from the time they were primed. Such quick jobs are always turned out with one coat of varnish, and are brought to the shop to be finished when the car can be spared. In large shops, a car may be turned out in less time than in small ones, more men being put on it to stripe and decorate, when it is ready; but it was generally conceded that the car should be twelve weeks in the painter's hands; the additional wear would fully pay for the time given the paint and va nish to harden before going on the road.

The time a car may run with safety or without injury to the paint before revarnishing varies on the different roads, some revarnishing once in six months, some in eight months, and others not being able to reach all theirs once a year. A car should be, to keep it in good order, revarnished once in nine months, and more especially those which are painted with dark colors, which soon become spongy and fade out if they are not kept well varnished; the light or yellow car retains its lustre double the length of time that a dark one does, and the expense of keeping up the painting on dark cars was one hundred per cent more than on those where white-lead was the principal material used; and for durability, it was acknowledged by all practical men, that no color could compare with the cream, lemon, light-yellow, straw, buff, or any color which is made with three-fourths, and upward, of lead.

A car painted with lead will run with safety after the varnish has entirely left it, and will then clean up and revarnish in good shape. This it is impossible to do with a dark color, so the painter must watch carefully every car, and get it in the shop, if he can, before it loses its lustre, or the varnish is all gone; otherwise, he will find it impossible to make even a passable job in revarnishing his dark work.

The interior finish of cars was not touched upon, except the head-linings. Most car and railroad shops were now painting their own linings, thus securing more substantial work and better fitting ones than when procured of the manufacturer.

The subject of engine-painting and the painting of road-buildings brought out remarks from several members who were more directly interested in these branches. Less work was being required on engines than formerly, but good, plain, durable painting was still in demand; and much of the cheap scrolling and pictures were being left off, which will take no credit from the practical painter, his abilities being devoted to laying the foundation and producing a good finish, which is the main thing required of the foreman in charge, whether he be a locomotive or car painter.

ROBERT MCKEON,
Secretary M. C. P. A.

KENT, OHIO, Oct. 1874.

Wheel-Tests at the Cincinnati Exposition.

A TEST of the comparative strength of double and single-plate wheels, manufactured by the Baltimore Car-Wheel Company, and exhibited at the Cincinnati Industrial Exposition, was recently made at the Exposition building, under the inspection of a committee consisting of Mr. H. M. Britton, president of the Railway Master Mechanics' Association; Mr. S. M. Cummings, master of machinery of the Pittsburg, Fort Wayne and Chicago Railway, and Mr. Alexander Gordon, of the Niles Tool Works.

A wheel of each pattern, and of the same diameter and weight (460 pounds), was subjected to similar tests. The double-plate or "Washburn" wheel had plates of a perfectly uniform thickness of $\frac{3}{4}$ inch, and fourteen brackets running from $\frac{7}{8}$ inch to $1\frac{1}{8}$ inches in thickness. The single plate was "scant" $\frac{7}{8}$ inch in thickness, and had seven brackets, $1\frac{1}{4}$ inches thick. The wheels were made of the same iron, except that in the mixture for the single plate a little more "high" iron had been used, which, while giving a stronger chill, might have been supposed to have decreased the tensile strength.

A line of twelve 11-16 inch holes was bored across the face of each wheel, the holes running quite through the plates and hubs. Into these holes were inserted steel drifts 7 inches long and having $\frac{1}{2}$ inch taper.

After 148 blows on these pins with a 27-lb. sledge, wielded in turn by three experienced strikers, the double-plate wheel showed a crack, and with 38 blows more the wheel opened evenly across the line of the pins, showing soft, fibrous gray plates and a uniform chill of $\frac{5}{16}$ inch.

In the case of the single plate, it was found impossible to crack it along the line of the drilled holes. After 133 blows on the pins, a slight fracture was seen. The wheel was then placed at an angle that it might be hit to better advantage, and 92 more well-directed blows resulted in breaking a piece out of the rim, but the line of drilled holes remained unbroken with the pins wedged in. The chill in this wheel was fully $\frac{5}{8}$ inch—twice as deep as that in the double-plate wheel—and showed a soft, tough backing and plate.

The two patterns were further tested by placing a wheel of each in one of the hydraulic wheel-presses exhibited by the Niles Tool Works, and capable of exerting a pressure of 400,000 lbs. The wheels had a bearing of 5 inches on the outer rim, at top and bottom, and the pressure was brought to bear upon the centre of the opposite side. The double-plate wheel broke at a pressure of 250,000 lbs. In the case of the single-plate, a much greater force was required, but the maximum hand of the gauge having caught, the exact pressure could not be ascertained.

An engine truck wheel of the neat hollow spoke pattern maintained its reputation as the strongest form of wheel made. With a bearing of four inches on the outer rim at top and bottom, the maximum power of the press (400,000 lbs.), brought to bear directly upon the centre of the opposite side, had no effect upon

it. Nor could a fracture be made with a taper steel pin ⅛ inch larger at its thickest end than the "bore" of the wheel, into which it was driven up to the maximum pressure of 400,000 lbs., without the wheel showing a sign of giving way. When afterwards broken under a drop, it showed a uniform chill of ⅜ inch and soft gray metal of uniform thickness, of a little less than ¾ inch in the arms and ribs.

One very important result of these tests is the light they throw on the comparative strength of single and double-plate wheels. The Baltimore Car-Wheel Company has for some time maintained that where first-class iron is used (such as their Baltimore iron, for which a tensile strength of 33,000 lbs. in the pig is claimed), a better wheel can be made of the single than of the double plate pattern.

A Self-Extinguishing Car-Heater.

THE destruction of railway-cars by fire, and the burning of passengers, is fortunately an event of not very frequent occurrence; but whenever such a calamity does happen, the necessity of some effective means of prevention is seriously discussed for the time being, and then the subject is dismissed until another burning takes place. Nearly every winter the community is shocked by one or more accidents of this kind; but if there was but one in every ten years as horrible in its details as that which occurred on the Buffalo, Corry and Pittsburg road, nearly two years ago, it would seem to render imperative the adoption of some plan to prevent cars from being set on fire by stoves, in case of overturn. It is obvious that nothing will secure the safety of passengers in such a contingency but an instantaneous extinguishing of the fire in the stoves, or by preventing its escape. The former is of course the surest, and we are informed that a heater has been devised, with a water attachment, which infallibly puts out the fire when the cars collide or get off the track. It is the invention of Mr. John Oliphant, of Pittsburg, Pa., and the experimental tests have been so satisfactory that a number of roads in that vicinity have had it placed in their cars. An occasion for a *practical* test will of course be deferred as long as possible, but it may arise quite unexpectedly at any moment. The heater is also a ventilator to some extent, as well as a self-extinguisher. We hope to be able to give a more particular description of it at an early day.

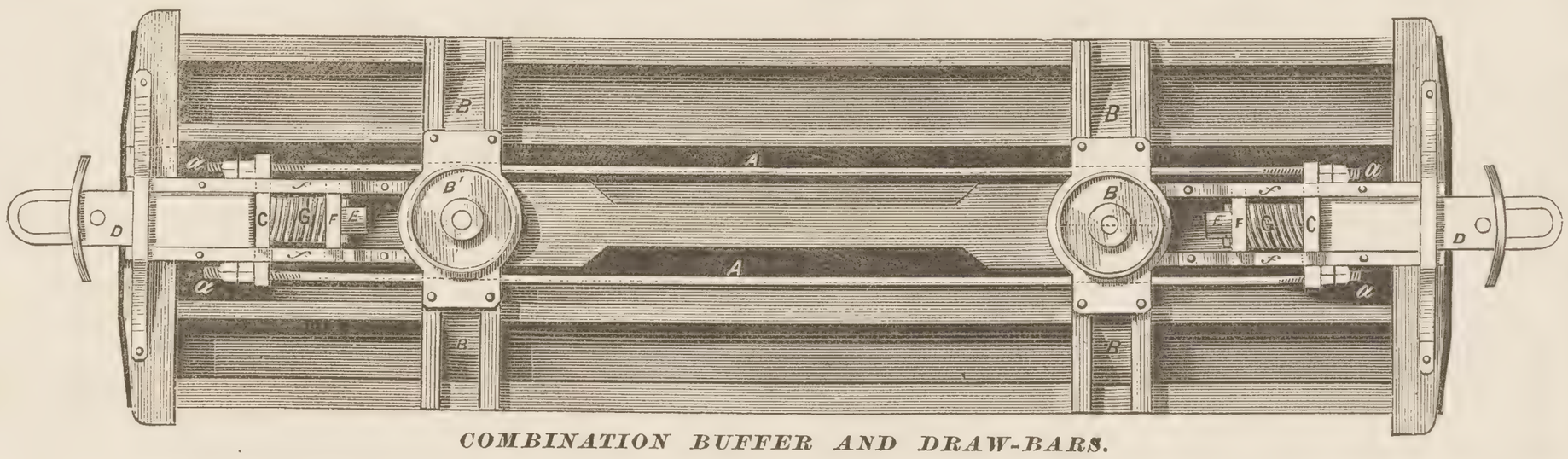
ARRANGEMENTS are being made to change the gauge of 91 miles of the main line of the Houston and Texas Central from Corsicana, Texas, south to Hearne, the crossing of the International. The break from 5 feet 6 inches to 4 feet 8½ inches gauge will then be made at Hearne instead of Corsicana. The machinery for changing car-trucks is being put up at Hearne. The company will then have 221 miles (Denison to Hearne) of standard gauge. This will probably also involve the change of the 45 miles of the Waco Branch.

THE London Society of Arts offers its gold medal of $105 to the inventor of an improved lamp or means of illumination suitable for railway passenger-carriages that shall produce a good, clear, steady, durable and safe light. It must be simple in construction, and capable of being readily cleaned and repaired. In judging the merits, cost will be taken into consideration.

Caum's Combination Buffer and Draw-Bars.

THE design of this invention is apparent from a glance at the engraving, which represents the under side of a car with the apparatus attached. The object is simply to draw, or rather push, the car from the rear draw-head spring instead of from the front one, as is the usual practice. The manifest advantages of applying the draught-power at this point will, we think, be readily perceived by every car-builder. The frame of the car, by being impelled from the rear, is relieved from any undue or injurious strain in starting or stopping; and the draught apparatus, by having a continuous and virtually independent action through the entire train, does not subject the forward car to any excess of weight or strain involved in drawing those behind it. In backing, the same advantage is realized, from the fact that the cars are pushed from the front, with no pressure on the rear buffer. The results are the same, without regard to the length of the train or the power applied to move it.

The details of the invention are so clearly shown in the engraving as to require little explanation. A A are the draught-rods connecting the coupling-plates C C. The bumpers D D slide in grooves, and have draw-bars E E united with them and held by a nut or key on the inner side of the plates F F. When the draught-power is applied, it is transmitted to the rear coupling-plate C, and compresses the spring G; but the buffing or concussion in backing is wholly sustained by the forward spring, the plate C sliding back upon the rods A A, the rear spring being at rest in buffing and the forward spring in drawing. In this way the draught-rods are never liable to be bent or broken. They can be arranged to pass through the transom-timbers, or be supported by hangers or staples. Each rod can, if required, be made in two parts, with a bolt-and-jaw connection or otherwise in the centre. The device can be attached to any car with small expense.



COMBINATION BUFFER AND DRAW-BARS.

We are informed that its utility has been thoroughly tested, and that it is being applied to the entire car equipment of the Albany and Susquehanna road. Mr. E. L. Caum, of Harrisburg, Pa., is the inventor and patentee. The American Railway Improvement Company, of the same place, are the agents for its introduction, to whom communications should be addressed.

Estimating the Power of Machinery.

A WRITER suggests the importance of some more accurate method of estimating the power of machinery, and especially of steam engines, in regard to which he says:

"Too often the buyer finds that he has on his hands a machine that is entirely unfit for the work for which he desired it, simply because he neglected, before receiving it, to submit it to a thorough examination and test, as he would have done if he had been purchasing a horse. Slowly, however, the idea is gaining ground in the community that a system of measurement should be carried out in the case of machinery as well as in the other affairs of trade; and it is a healthy sign to see that tests with the indicator are becoming more and more common before the sale of an engine. But, useful as the test may be in many respects, it falls far short of meeting the full requirements of the case. If a fifty horse-power engine is required, for example, in a given case, it is not sufficient that the engine should develop fifty indicated horse-power. Some of the power produced by a prime mover is expended upon the resistances of the machine, so that in the case under consideration, something less than fifty horse-power would be available for useful work. How much less the effective horse-power would be is a matter that could only be settled by experiment. Experience shows that in an engine of this kind from fifteen to fifty per cent may be expended upon the prejudicial resistances, the amount varying with the construction and adjustment of the various moving parts. Some few builders of steam-engines have recognized the importance of a test of this kind, and are accustomed to subject every engine built to experiment with both the friction-brake and the indicator. In such a test, the band-wheel of the engine is encircled by a strap, which enables the work of the engine to be converted into friction between the wheel and strap, and this can be measured by suitable apparatus. Other builders are accustomed to take indicator diagrams from their engines, both when doing full work and when running light at the same speed—estimating the difference between the power calculated from the two sets of diagrams, as the useful work developed. A test of this nature, however, is subject to many inaccuracies. The friction of an engine, depending upon the pressure exerted on the bearing surfaces, is ordinarily greater when the engine is doing useful work than when it is running light, and it sometimes happens that the increased strains throw the moving parts out of adjustment, so that the friction is still further increased. These remarks are fully justified by experience, and it can be confidently asserted that the test with dynamometer and indicator is the only one that can be relied upon. It is not necessary to use a friction-brake to determine the useful power of an engine. A dynamometer can be employed which will measure the work during transmission. To illustrate this method of measurement, suppose that the band-wheel of the engine is loosened, so as to revolve freely on the shaft, and is connected by springs, weights, or similar devices to a piece of mechanism that is firmly attached to the shaft. Under these circumstances, the strain on the band-wheel, when work is performed, will cause it to turn on the shaft, acting on the spring or other device, producing a pull or push, which can be measured by suitable apparatus. Every revolution that the engine makes, an amount of useful power will be exerted, which is represented by the strain in pounds produced upon the connecting mechanism, multiplied by the distance in feet through which the mechanism passes; and this number of foot-pounds, multiplied by the revolutions per minute, and divided by 33,000, will give the useful horse-power of the engine. Transmitting dynamometers of this general character are frequently more convenient of application than a friction-brake, since by the use of the latter apparatus all the effective power of the engine is converted into friction, while in the former case it is both utilized and measured. There are several transmitting dynamometers in the market that give satisfactory results, if carefully applied; but there is room for the introduction of one of simpler form and readier application, and the subject offers a fine field for inventors."

A number of cars constructed at Troy have been shipped to Australia.

The National Car-Builder

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BY

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JAMES GILLET, EDITOR.

Terms, One Dollar per Annum.

NOVEMBER, 1874.

Editorial Announcements.

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No. 32 Warren Street.*

Advertising Rates.—*For one square, or one fifth of a column, $5 per month, or $50 a year. For half a square, $3 per month, or $25 a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. Dinsmore, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

Engravings and Illustrations.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in The National Car-Builder *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Warming and Ventilation.

It is, we think, a matter of some doubt whether ideal perfection in the warming and ventilating of railroad-cars will ever be fully realized. The problem involves too many conflicting elements to admit of a solution that will be entirely satisfactory to every body. People who travel by rail, or in ships or balloons, are necessarily subject to risk and inconvenience by way of compensation for the advantages of rapid transit. Each of these methods is attended with more or less discomfort and peril, because it is in the nature of the case unavoidable. While this is true as a general principle, it does not follow that railway travel can not be rendered safer and more agreeable in many respects than it now is; on the contrary, we think much can be done to relieve the misery arising from present defects in the ventilation and warming of cars.

Without going into any scientific analysis of the elements of the atmosphere or the nature of heat, or getting bewildered in the mazes and mysteries of technical research, we shall content ourselves with calling attention to a few obvious facts and considerations which are patent to the most ordinary apprehension. What railway passengers require in winter is that their feet shall be kept warm, and their heads at the same time comparatively cool. To insure the former, the temperature next the car-floor should not be allowed to fall below 65°. No passenger, however exuberant his health, or however extreme may be his notions of Christian forbearance, can keep good-natured for any great length of time with an icy feeling about his pedal extremities; neither will he submit to have his head roasted in order to keep his feet comfortable. Nothing short of a uniform temperature of about 70° is consistent with amiability in railway-cars. The average passenger cares little for ventilation so long as he feels chilly. He may be starving for oxygen or breathing carbonic-acid poison, but if he is less sensible of it than he is of feeling cold, he is quite apt to regard the former with indifference, and forego any solicitude about it until a more suitable occasion. This difference in temperature between floor and dome, ranging in cold weather from 30° to 60°, and between the floor and the heads of passengers, say, from 20° to 40°, is the great difficulty to be overcome in the warming of cars. That this inequality can be greatly diminished, hardly admits of a doubt. The obvious way to bring it about would seem to be the radiation of heat or the influx of warmed air at the bottom of the car, either along the sides or under the seats, while at the same time the cold and vitiated air should also be exhausted or expelled from the bottom. This would necessarily create and keep up a movement of the entire volume of air, which would amount to good practical ventilation—good enough, at all events, for people who do not appreciate its importance. Many cars are already provided with devices which accomplish this more or less imperfectly; but a far greater number rely upon red-hot stoves and top-ventilators, without any arrangement for distributing the heat or keeping it uniform.

Probably the most inexpensive and readily available of any of the methods in use, designed to equalize the temperature, is that by which the air is admitted through a slatted opening in the end of the car and directed upward by the inclination of the slats, so as to mingle with the warmed air over the stove, and prevent any direct current from reaching the passengers. This plan, in connection with exhaust-flues from the floor at suitable points, secures a better distribution of the fresh air, and equalizes the warmth. Dr. Allen's method, illustrated and described in the March number of the Car-Builder, seems to be specially adapted to an equalization of the temperature by warming the air in furnace-jackets or chambers underneath the car, introducing it at the sides next the floor, and as it rises, the cooler and heavier air is forced into exhaust ventilators at the ends of the seats next the aisle, and escapes through vertical flues in the car-side. Steam or hot-water pipes are the most expensive, but they afford an agreeable warmth, and the heat is radiated in the right place, that is, where it will benefit the feet.

We have thus indicated what we conceive to be the essential points, which are bottom ventilation both for exhaust and supply—but more especially for the exhaust—and also bottom heating. There are also some collateral matters which we will briefly refer to. The heating apparatus should be capable of easy regulation, and brakemen should be taught to adapt it to the varying conditions of winter temperature. We say *taught*, because some of them lack the native intelligence to find out how to do it without teaching. The admission of fresh air should not be subject to the control of the passengers, nor should it be necessary to shut it off in order to be comfortable. The exhaust-flues should have movable hoods at their tops, or valves at the bottom opening upward, so as to prevent reverse currents. If possible, the warmed air introduced into the car should be supplied with extra moisture, otherwise the throats and lungs of passengers will be taxed to make up the deficiency. The stoves or furnaces should be made of boiler-iron, and so securely fastened to the floor and locked as to prevent the fire from escaping in case of accident; or, what is still better, they should be provided with a reservoir of water attached in such a way as to instantly extinguish the fire should they be forced from an upright position by collision or other cause. Something of this kind, we believe, has been tried on several Western roads, or rather, has been proved to work well by experimental testing.

We are well aware that this twin problem of ventilation and heating has been belabored until it is almost a jelly, so to speak, but it is one which can not be put aside for all that. We feel in duty bound to hammer away at it. The entire community, irrespective of creed, caste, color, or condition, is directly interested in whatever pertains to the individual well-being of its members. As an example of what thousands experience who travel in winter, we will instance a complaint made to us last winter, by a lady who was on her way from St. Louis to Boston, but was compelled to avail herself of the hospitality of some acquaintances at Erie, Pa., in order to recuperate from prolonged suffering from cold feet, aching head, and suffocating lungs, while traveling in the cars, averring that she would rather ride in a car made of undressed boards, if the floor could only be kept warm, than in a gorgeous palace-coach with, as it seemed to her, 100° difference in temperature between floor and dome.

Railroad Defaults.

The *Financial Chronicle* publishes a corrected list of 108 railroads which have failed to pay interest due on their funded debt, and which have not yet resumed interest payments or made any final adjustment of their affairs. The total amount of bonds issued by these roads on which interest has been passed is $497,807,660. These defaults have not all been in consequence of last year's panic, but have occurred, in the case of 34 roads, comprising about 30 per cent of the whole amount, at various times previous to the panic. The entire bonded debt of all the roads in the United States is estimated at $1,825,000,000, and the proportion in default is therefore about 27 per cent. About 85 per cent of this proportion—or 422 of the 497 millions—are bonds issued by roads which have been constructed within the last six years, or during the period when the "mania" was in full blast. It is also estimated that the aggregate of bonds held abroad is about $375,000,000, and that 40 per cent of them are in default.

This, to be sure, is not a very flattering exhibit, but considering the vehemence of the craze and the suddenness of the crash, it might have been worse. Three quarters of the aggregate funded debt of the roads remain untainted. As for the stock, a glance at the share list tells the story about dividends, without taking into account a vast quantity of "wild-cat" and other railway stocks unknown to the Stock Board, and having no quotable value. The panic was strictly a railroad panic, which necessarily affected all other industries. Railroads, in one way or another, were every body's customers; and so long as eager investors scrambled for bonds, and bid fancy prices for stocks which had cost nothing, every thing went booming. The repairing of the havoc and the restoration of lost confidence will be slow, as a great many are beginning to realize. It must be done in the "regular" way, and not by financial juggling. Some new roads will be built where they are really wanted, but for a few years to come the new construction will be light compared with what it has been since 1868. So far as general business is dependent on the expenditure involved in building new roads, there will be continued stagnation; but at the same time there will be progress. Debts will be liquidated, the stocks of manufactured goods will be largely reduced, extravagance will be checked, speculative enterprises will be engaged in with greater caution, and a healthy revival of legitimate trade based on exchange and consumption will be sure to follow.

Master Mechanics' Seventh Annual Report.

We have received from the Secretary a copy of the official report of the proceedings of the Railway Master Mechanics' Association, at its meeting in Chicago, in May last. The volume is similar in appearance to that of last year, but contains nearly a hundred more pages. The larger portion of it is occupied with reports of committees and papers upon special topics contributed by prominent mechanical engineers, embodying a great quantity of valuable information upon locomotive construction and management, broad and narrow-gauge rolling-stock, train-brakes, axles, tires, valves, fuel, mechanical laboratory, etc. The in-

terest of the volume is also enhanced by numerous illustrations, tabular statements, and statistics, which will be found exceedingly valuable for reference and otherwise. The discussions are very fully reported, and occupy nearly a third of the book. They are printed in smaller type than the other portions, and contain the views and practical experience of some of the best railway mechanics in the country. The report, as a whole, is worthy of the careful attention of railroad men, and can not fail to add to the reputation of the Association and make its transactions more widely known and appreciated both in this country and abroad.

We have no space for a more extended notice in our present issue, but shall hereafter make such extracts as may be deemed of interest to our readers, after a more careful examination of the contents of the report.

Views of a Railroad Mechanic.

To the Editor of the National Car-Builder:

DEAR SIR: The suggestive and timely article in your last issue, in reference to the mistaken policy of railroads in purchasing low-priced and inferior supplies, prompts me to submit for the consideration of your readers some reflections of my own on the same subject. During the past fifteen years I have been practically familiar with the operations of railway shops, and more especially with the construction and repair of locomotives. In the course of my experience I have always found the scrap-heap to be worthy of particular attention, and suggestive of many valuable ideas bearing upon the subject of railway economy. In this accumulation of débris is to be found the waste material of the line, the broken fragments, wrecks, discarded inventions, and fossilized mechanism of all sorts mingled together in chaotic confusion, but presenting an instructive record of devices, meritorious and otherwise, and of material, the quality of which has been tested by service in days gone by. By a careful inspection of these remains, the intelligent mechanic can avoid the errors of the past, and acquire much valuable knowledge for the future. He can discriminate between wisdom and folly, between what is real and what is fallacious, between cheap things which have proved to be costly and costly things which have turned out to be cheap. If scrap-heaps are instructive now, they are likely to be still more so in the future, when the fruits of the policy which is now being pursued shall be gathered in, as they surely will be at no distant day, in quantities that will cause the present scrap-heaps to look like mole-hills in comparison with those of a year or two hence. The present rage for cheapening every thing which enters into railroad consumption necessarily makes quality subordinate to price, and crowds out of the market whatever is not suited to the demand. Meantime, the wear and tear of the service is in no wise diminished, but rather increased; and this will evidently make short work with every thing in the category of cheap material. The mechanical bone-yards will tell a tale of short-sighted economy and wasteful expenditure which railway managers can not fail to heed. Then there will be a reaction, as there always is when a mistaken policy has reached its climax, and demonstrated its absurdity.

The economy of using good instead of poor material is strikingly manifest in the experience we have already had in wheels, tires, rails, and various other articles of railway consumption. Every one knows how steel tires have taken the place of wrought-iron ones, the difference in price being as nothing in comparison with the advantages gained. The same is true as regards iron and steel rails. The superiority of the latter is so fully recognized that nothing can prevent them from taking the place of the former as a matter of pure economy, unless their quality shall decline from the original standard. Just here is where the danger lies. If manufacturers yield to the demoralizing influences of reckless competition and the increasing clamor for low prices, the reputation of steel rails will suffer, and it will take years to re-establish it. But if the policy of Krupp with respect to tires is firmly adhered to, by a refusal on the part of manufacturers to cheapen their product in order to meet a temporary and short-lived clamor for low prices, if they will turn out or sell nothing in the shape of a rail but what is equal to the tests of time and traffic, it will be all the better for them in the future, as well as for the lasting benefit of the roads and of all business interests dependent upon rail transportation.

It is not long since the writer found in the wheel-yard of a prominent railroad line, a lot of wheels which had been taken from some worn-out cars and consigned to the scrap-pile. They were of the old flat-spoke and divided-hub pattern, had worn out two sets of axles, had been in service twenty years, and would have worn out another set, had not the master car-builder been prejudiced against them on account of their form. The tread of these wheels, although much worn, was uniformly even, and as truly circular and conical as any new ones in the yard. A sledge was brought to bear upon them and made short work of the spokes, but the tread refused to yield until placed under the "drop." Below the chill the metal was of a steely gray color, and the chill itself was of a silvery brightness, its texture being as close and as uniform in appearance as that of refined cast steel. The fractures, when compared with those of some noted modern wheels, showed very clearly the superiority of the metal in the old ones. How many miles they had run it was impossible to ascertain, but any wheel-maker who will put such stock into wheels nowadays may safely warrant them for 100,000 miles, and have a liberal margin for excess. The guarantee for wheels at present does not, as a rule, we believe, exceed two years of service, while makers are reluctant to warrant at all on a basis of round mileage. Let us see what the difference is between this and 100,000 miles. The car accountant of the Lake Shore road reports an average mileage for the year ending June 30, 1874, of 15,695 for box-cars, 32,180 for stock-cars, 7685 for platform-cars, and 7807 for coal-cars. This road, it must be remembered, is a long one with a heavy traffic, which keeps its rolling-stock on the move with comparatively little rest at intermediate points; and consequently a two-years' mileage will range above the general average. Here, then, we have a 32,000 maximum mileage for modern wheels, against 100,000 minimum for the old flat-spoke and divided-hub wheel broken up under the drop.

I only cite this as an illustration of the economy of the cheapening process, and without any disparagement of wheel manufacturers. The present tendency is all in the same direction as regards innumerable things which enter into railway consumption. An odor of "shoddy" is perceptible in all branches of industry. A maximum of show for a minimum of price, a printed chromo instead of a real painting, paste instead of gems, any thing to save appearances. The penalty for all this is inevitable, and is as sure to follow as effect follows cause. Every thing in railroad operation depends on integrity and an utter rejection of shams and mere expedients; such, at all events, are the impressions of a railroad

MECHANIC.

The Car-Painters.—A Correction.

IN the brief notice of the doings of the Master Car-Painters' Association which appeared in our last issue, a discussion is said to have taken place on the comparative merits of different woods, and also of iron, for purposes of car-paneling. This is an error, as it conveys the impression that the Association was meddling with matters outside of its legitimate sphere. The discussion was in regard to paint *material*, and the most suitable mixtures to be used as a priming coat upon different kinds of wood, and also upon iron, which is employed for battens and other purposes where it is exposed to the weather equally with the paneling.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the rooms of the Association, on Thursday evening, 22d October. A large number of gentlemen were present, including car-builders, car-wheel manufacturers, and others.

Dr. W. C. TILDEN, of the Erie Railway, being present, and having accepted the invitation extended to him at the last meeting, was introduced by the chairman, and made an interesting address on the Nature and Preservation of Wood. Without attempting to give even a summary of it, which our space will not permit, we will merely indicate very briefly its tenor and drift.

The speaker being a practical chemist, and having devoted several years to an investigation of the composition and treatment of timber, he would aim to present facts rather than theories. The subject was one of great complexity, on account of the varying properties of wood, and the different treatment it required under different circumstances. Its reproduction in this country was far behind the ratio of reproduction in Europe. We were at present making serious inroads on our timber resources, so much so that even the present generation, to say nothing of posterity, would be greatly benefited by the application of the best known methods for its preservation. The Doctor then explained at considerable length the chemical constitution of wood so far as it could be ascertained, the peculiarities of growth, and the conditions which had to be taken into account in deciding what was the best means of preserving it from decay. In his judgment, no process yet discovered was so effective or had stood better tests than that of creosoting, or filling the pores with the dead oil of tar. This process was covered by no patent. It was much used in England, and had given excellent results. After concluding this portion of his address, some exceedingly interesting views were exhibited by means of a magic-lantern, consisting of magnified cross-sections of various kinds of timber, showing the variations in structure, the peculiar form and grouping of the sap-cells, and other features which are not perceptible to the ordinary observer. At the conclusion, a vote of thanks was tendered the speaker for his instructive and interesting address.

CAR-WHEELS.

The meeting then took up the] subject of Car-Wheels.

MR. M. N. FORNEY opened the discussion by asking, "What makes iron chill?"

MR. W. W. SNOW, of the Ramapo Wheel and Foundry Co., being called for, said he could not tell why iron chills. Some anthracite irons would chill, but, as a general thing, charcoal irons chilled better, although some kinds of charcoal iron were very difficult to chill. He thought much depended on the texture of the iron.

MR. JONATHAN SCOVILLE, of J. & N. C. Scoville, of Buffalo, suggested that the presence of carbon in the iron had something to do with the chilling properties. There is more or less carbon in iron, some in mechanical combination, and some chemically combined. In the manufacture of car-wheels, this carbon is crystallized out. No. 1 and No. 2 iron will not chill. No. 3 will chill slightly. No. 4 will chill better. If left to itself, the carbon will naturally crystallize out, but chill it instantly and the iron sets so quickly that the carbon is chemically combined. An anthracite iron will chill if it is run what is called sufficiently high, but usually an anthracite iron is made so soft that the carbon is almost entirely mechanically crystallized. The English chilled short is hardly an anthracite iron, but coke iron enters very largely into the composition of that short.

MR. SWETT, of Troy, had often been asked why anthracite iron would not chill, but had never seen any clear explanation. He had assumed that in anthracite coal the carbon is in a condensed condition, and in the melting process it is brought in contact in a greater quantity with the particles of the ore, so that

it was impossible to make a good car-wheel from anthracite iron. Though he had seen good, fibrous iron, it was almost wholly discarded by car-wheel manufacturers, from the fact that it took up too much carbon. The fibre becomes crystalline, and the free carbon separates the particles of the iron, and it becomes cubical in form. In charcoal, there is of course as much carbon, but the coal occupies a greater space, and the iron comes in contact with less carbon. All charcoal iron for car-wheel purposes is supposed to be made of brown hematite ores. When the ores are put into the furnace, they give off the hydrates and oxygen and take up carbon, and when they come to the bottom of the furnace and get up to the melting-point, if the heat is intense enough, the ore will absorb carbon enough to change the condition from No. 1 to No. 6. More depends on the amount of heat than on the amount of coal.

MR. FORNEY.—Is the chilling property due to the amount of carbon that is in chemical combination with the iron, or is it that the iron and carbon are in mechanical combination?

MR. SWETT.—If there is a large amount of carbon present, either mechanically or chemically combined, I think it will never give good chilled iron. If it is not in mechanical combination, it will not chill.

MR. SCOVILLE.—The hematite ore is very porous and absorbs the gases readily, but the magnetic ore is likely to be still cold on the inside when it is well heated on the surface. The Superior and Iron Mountain irons chill comparatively easy. To make a good wheel, you should have a neutral ore, which nearly all of our hematite ores are.

The PRESIDENT now propounded the following conundrum: Why are there blisters, or honeycombs, on the tread of the wheel?

MR. SWETT thought they were defective spots in the tread caused by running the cold iron against the chill and forming a coating or oxidization of the surface, so that it does not adhere or unite again, and forms these chill-spots.

MR. W. E. CHAMBERLAIN asked why the chill was not of a uniform depth all around.

MR. SNOW said much depended on the manner in which the iron was poured into the mould; in some cases, the flow of the iron cut away a part of the chill.

MR. CHAMBERLAIN said he had known honeycombed wheels to start from New-York and go safely through New-Haven, Hartford, and Springfield, and when they arrived in Boston, the chill was almost worn through.

MR. SCOVILLE said the difficulty with the wheels he speaks of is they are lacking in chill. The spots referred to are simply round, isolated spots. They will be highest in the middle, but the edge round like a ring-a-round. You break the iron through the spot and you will find good iron under it, and perhaps a quarter-inch chill. A wheel made of magnetic or specular ore is almost free from these spots.

MR. SWETT remarked that he had found on using wheels for a number of years, they elongated and were not round. He thought perhaps the chill was thinner on one side than the other, and that it expanded more rapidly in that direction, and that when the wheel was cast very hot, we got a uniform smooth face on the wheel without these marks, after the wheel had been running for years. The cooler the iron, the more those marks would appear. He thought the difficulty would be obviated by the use of a single-plate wheel—a corrugated plate, with the hub far enough above it so that you can cast the wheel with much hotter iron and get almost a perfect tread.

MR. SCOVILLE disagreed about the single-plate wheel. There were a great many more double plates made than single plates, and so there were more of them spotted, but reduce it to a percentage according to the number in use, and he thought the single plates would show as many as the others. The last wheels he put under four engines were single-plated and excellent wheels, but they had spots on them. It was not because they were not chilled, but the spots came. Still, the spots are much more frequent than they were 15 years ago, and there must be some reason for it.

MR. W. R. DAVENPORT, of Erie, Pa., did not think the use of a single-plate would obviate the difficulty with the spots. They had made both kinds of wheels, and the single-plate was of a pattern supposed to be as good as could be gotten up, but it did not obviate the difficulty, and he did not think it was in the shape of the wheel at all. He did not like to express an opinion as to the cause until they were through with some experiments in which they were engaged. Whenever that could be remedied, the hematite wheels would "scoop the market," but that is the trouble now. We have the strength and the durability, and if we can keep clear of those spots, we can beat any other iron that is made.

There was another matter that he wished to speak of, and that was the flange-wear of wheels. He knew one thing that most car-builders would bear him out in: that a great deal of carelessness had crept into the wheel-fitting, and many and many a time wheels of two different circumferences get on the same axle. You all know when one wheel travels faster than the other on the same axle, and what that can not help resulting in; it has not made its mileage nor broken in a smash-up, and therefore the wheel-maker has to take it. But the poor wheel-maker can not help himself. The difficulty is that all 33-inch wheels are not of the same size. I suppose that the car-builders have also discovered that the trucks are not always square, or, as a mechanic would say, they don't "tram," and that is bad on the car-wheels and severe on the truck. We don't happen to have the buying of the iron, but I imagine that the pockets of the company suffer even worse than those of the poor wheel-maker if the iron in the wheel is vastly harder than the iron in the track. For every mismated pair of wheels that goes on to a road, the company may charge to profit and loss $50 at least. Of a pair of wheels that made great trouble on a Western road about 90 days ago, it was found that one was about three inches greater in circumference than the other on one axle. It is of the utmost importance that the two wheels on the same axle travel the same distance; and in order to do that, I know of no simpler way than to have the wheels carefully paired when put on. When you are putting on your wheel, push off both old wheels, and fit them up right again. We can save the companies a large amount of money by giving this matter some attention.

MR. C. E. GAREY wanted to know why the core could not be in the centre of the wheel; but the question failed to elicit any definite answer at the time.

MR. SNOW said Mr. Davenport's remarks about fitting wheels reminded him that some roads in the country have been in the habit of fitting wheels to a certain gauge. Most car-builders tell him they are fitting wheels $\frac{3}{4}$ of an inch laterally, but his experience was that they are sometimes as much as $1\frac{1}{8}$ inches. He had counted 40 pairs of wheels in one yard that were broken on the flanges. On an accurate measurement, it was found that the gauge was $1\frac{1}{8}$ inch lateral motion, and wheels were pressed on to $1\frac{1}{4}$. Pretty nearly all the 40 pairs were pressed on to more than $1\frac{1}{8}$ inches. The cause of the breakage was, in his opinion, the strain in passing a stiff guard-rail and a solid frog; the motion being sudden, carries the wheels over and strikes the opposite side of the track and takes the flanges off.

MR. CHAMBERLAIN desired to be informed how you were going to put old wheels of the same size on the axles when the wheel manufacturer had no surety that he could make two wheels of the same size from the same chill. For instance, in buying 50 wheels from a manufacturer, you may possibly find two wheels in the whole lot that will caliper exactly by measuring the circumference. Many persons would be surprised to find how little difference in the circumference it took to cut the flange out.

MR. SCOVILLE said if you take two wheels marked 6, those wheels will be of the same size, but there will be one wheel marked 6 and another marked 4, because the chills are not exactly alike. Every man who has watched a wheel-moulder will have seen him grab hold of the chill and give it a whack with the hammer, and this elongates the chill in one direction. The reason the core is not in the middle, is because it isn't put in the middle, and the fault is with the makers. They don't like to cast a wheel twice. If in casting the wheel, in lowering it into the pit it touches one side, it hurts it.

MR. SNOW said that where a flange wore, he had often found that one wheel was pressed on farther than the other.

MR. FORNEY thought the shape of the flange was unsettled. The fact that the same makers have different forms indicates that they are not quite sure that they have the correct forms. Where the side of the rail is curved outward, the flange of the wheel cuts it down.

MR. C. A. SMITH called the attention of the master car-builders to the fact that there was trouble with the side-bearings of the trucks. It is the side-bearings that take the load when the car turns a curve. If we have proper side-bearings that allow a free movement, so that when the car strikes a straight line, the truck will take a straight line, and not take the flange of the wheel to bring it into line, it will remedy the difficulty.

MR. F. D. ADAMS thought they would be doing the wheel-makers justice if they exonerated them from the wear of the flanges. He did not believe it was attributable to any thing pertaining to the manufacture at all, unless in some exceptional cases, but rather to mechanical defects. Mr. Smith had just touched the point when he spoke of the extremely severe strain on the sides of the truck which prevents its curving with the curve of the track. He thought the fact that so many cars are built by contractors who try to build them in the cheapest possible manner, had something to do with it.

MR. W. E. PARTRIDGE said he had investigated one point of the wear and found that it arose from bad joints. The wheels struck a bad joint and were thrown over, jumping against the other side.

MR. SMITH called attention to the hardness of the pressure between the flange and rail when rounding a curve.

MR. SNOW said that those who ask why we don't make as good wheels as they formerly did, forget that cars are heavier and trains run faster and farther, and the wheels are in more continuous use than they were ten years ago.

The PRESIDENT thought one of the important causes of the wear of the flange was the bearing of the car on the side-bearings. You could hear them scream after passing a curve for half a mile before the truck would get in line with the track.

The Chair then announced that the next subject would be: Why do we have so many broken wheels?

MR. DAVENPORT said we had gone on increasing the weight put over the wheel, and the speed at which we drive the wheel, and we wonder that it breaks. We know that we have improved materially in the strength of the iron as it comes from the furnace. We think we have improved in the manufacture of iron in the form of a wheel. You have probably noticed a frog worn out, but left in the track still. You will run a train 50 miles an hour, with coaches weighing 40,000 pounds, and engines weighing a good deal more, over that bad frog, and then people ask why you do not make a wheel now, that will stand that kind of thing. If the trackmen will be as careful in keeping up their track, keeping out their bad frogs, as the wheel-makers are in making their wheels, I think we will discover a great difference in the breakage. Then there is such a thing as sliding a wheel at one point until you heat it up so as to have a fracture at that point. We hear occasionally of wheels that have run 20 years, and they say: "Ah! I wish

they made such wheels nowadays." Well, we do make such wheels now, but they haven't had a chance, and if we wait 20 years, we will have them that have been running 20 years.

MR. SNOW thought the breakages were partly due to the change made in the truck, by the car-builders driving the hub back from the centre.

MR. ADAMS, however, contended that this was not the case, as the truck had not been so changed as to throw the wheel back on the inside.

MR. SCOVILLE said, when a wheel broke it was from poor iron or bad handling. Occasionally a wheel will break very mysteriously, but usually it is owing to bad metal. He had noticed a new class of breakages, a crack from the hub toward the circumference of the wheel. In many instances, you break the wheel and find it exceedingly hard for the sake of getting a long mileage. It is cracked, and almost invariably it has come from a heated journal. The wheel has got hot and the iron won't give. But these wheels very seldom go to pieces.

MR. ADAMS.—Don't it make a difference whether you cast in a cupola 20 wheels a day or 75 ?

MR. SCOVILLE.—There is one trouble that wheel-makers have got into. They have had cupolas that would make 15 or 20 wheels a day, and they have tried to get 50 out of them. The true way to melt car-iron is to melt it as long as you would in a furnace.

MR. SNOW.—Yes ; after a cupola has run two hours and a half, it is time to dump it out, and the longer it runs, the more it is deteriorated. I have got a cupola that runs 100 wheels a day, and it makes better wheels than we get out of any small cupola we have. The iron is two or three hours heated, and becomes a higher quality of iron.

MR. SCOVILLE.—In England they commenced with air furnaces, but now they use cupolas altogether, very large, and with a higher draft.

MR. DAVENPORT.—We have been testing this matter very carefully for six months past ; we have one cupola of 6, and one of 7 feet, about 42 feet high. We can run down 100 wheels from one of these cupolas, and bring the iron in as nice shape as you ever saw iron worked. We have made some important changes in our cupolas to do it, and I have no doubt that all that Mr. Scoville has said is true, that if you wire-draw your blast you don't melt your metal as it should be melted. I apprehend there is very little breakage of wheels, in fair service, of any maker that claims to make a first-class wheel nowadays ; they are cheap wheels, bought for cheap wheels.

MR. SWETT related an incident which occurred during the war when he and others had a contract for making 15-inch shot for the Government. He bought some charcoal-iron, and they commenced making shot, but word was sent to him that the iron was bad ; it was dirty, and the slag ran over the top of the cupola. He finally visited the works, and found them running the gauge to a $\frac{5}{8}$-inch pressure. He told them to turn off the blast to $\frac{3}{8}$, which they did, and what slag was made he could have taken in his two hands and carried it out. As to the breakage of wheels, he did not think it depended altogether on the quality of the iron. He had seen good wheels come into the yard with the plates broken, and he could take the blade of his jack-knife and put it right through the plate of the wheel. On the other hand, he had seen wheels in the yard that had run for years, and when they broke them the iron was gray, and yet the wheel was good and had a good chill on. His idea was that one of the most essential things was that the wheel should be cooled properly. You may put ever so good iron into a wheel, and unless the heat is taken off from the hub, and it is cooled properly, there will be a strain between the plate and the hub, and they are likely to pull apart.

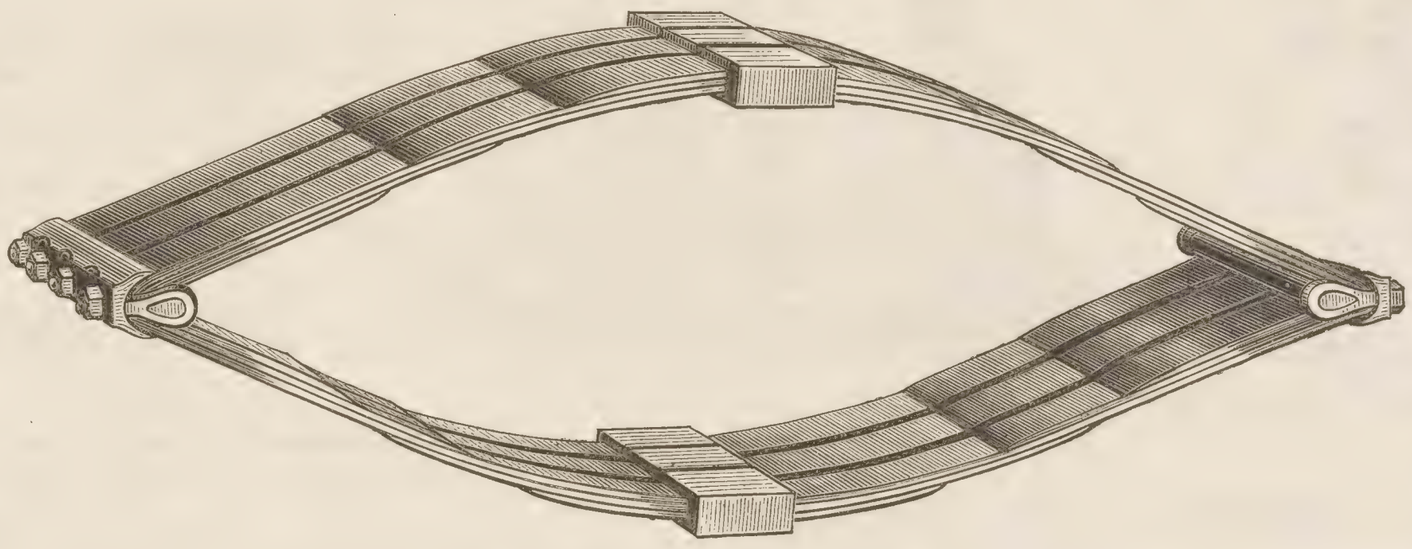
MR. SCOVILLE thought the master mechanics ought to insist that every broken wheel be returned to the makers to replace. It would give the makers much valuable information.

On motion, it was resolved that this subject be continued at the next meeting, and that the car-wheel manufacturers be invited to attend.

The meeting then adjourned.

Cliff's Elliptic Car-Spring.

WE illustrated and called attention to this invention in our August number, since which some improvement has been made in its construction. The nature of the improvement will be apparent by comparing the engraving we now present with the preceding one. The leading peculiarity of the spring is in no wise changed, the modification consisting in the camber or arch being made to conform to a more perfect oval, thus making the curves at the ends less gradual, while at the same time a more perfect bearing is provided for the inside end-leaves upon the clamp-pin, which prevents the possibility of any breaking strain upon the curving point. This has been suggested by a series of experiments designed to test in the most thorough manner the strength, elasticity, and general capacity of the spring. In its present form it possesses all the desirable qualities of a complete elliptic, dispensing with all superfluous weight, and utilizing to the utmost every pound of material. In this respect, it is a decided improvement upon ordinary elliptics, saving a large percentage of cost and fully thirty per cent of dead weight, without sacrificing any element of durability. It is already in practical use on a number of roads, and has justified every claim made in its behalf. It is equally well adapted to freight and passenger service ; and by a suitable modification can be applied to ordinary vehicles. The steel being equally distributed in every part, the strength is uniform, and every leaf has a free and independent action. It is now being rapidly and successfully introduced, and bids fair to become *the* spring of the future. Manufactured by Vose, Dinsmore & Co.



CLIFF'S ELLIPTIC CAR-SPRING.

A CURIOUS piece of mechanism has been produced by an Amsterdam jeweler, called the " Great Mechanical City," and is twenty feet long by fifteen feet wide. There are houses, castles, churches, and stores in it, just as they appear in almost any European city. People walk and ride about. Horses and wagons and railway-cars pass through the streets. Boats pass up and down the river, while some are loading and others unloading at the docks. Mills are in motion. A fountain plays in the public park, and a band of music fills the air with melody. There are also forts with soldiers parading about them, blacksmith-shops with artisans at work in them, and pleasure-gardens with people dancing in them.

THE Huntingdon (Pa.) Car Works have received an order for a large lot of freight-cars.

THE Baldwin Locomotive Works have just completed two locomotives for a three-foot gauge railroad in Brazil. One is designed for passenger and the other for freight service. The passenger engine has 12-inch cylinders, and four drivers 42 inches in diameter ; the one designed for freight has three pairs of driving-wheels 40 inches in diameter, and 13-inch cylinders.

THE Pullman Car Works, at Detroit, have recently shipped to England nine palace-cars to be used on the railways there. A number of workmen go out with them to put them together, as they are necessarily shipped in pieces.

THE manner of giving the correct standard of time of the Philadelphia and Reading Railroad Company to all its telegraph stations, 225 in number, along the main road and all its branches, is as follows: At three minutes to 4 o'clock P.M., daily except Sunday, all the business along the lines is suspended ; and by means of a series of repeaters, all the lines of this company, 36 in number, are arranged so as to be operated and controlled by one operator at the Reading office, who has a chronometer before him, from which the correct time is given. Commencing at three minutes to 4 P.M., the Reading operator says "time" on the lines, which calls the attention of all operators to adjust their clocks, and is continued at short intervals until five seconds to 4, when he opens the circuit. At 4 o'clock, he makes one tap ; at fifteen seconds after 4, two taps ; at thirty seconds after 4, three taps ; at forty-five seconds after four, four taps ; and at one minute after four, five taps. By this arrangement every telegraph station is able to get the correct time to the second, daily, and thereby have the railroad clocks and watches of the employees properly adjusted, which is a very important matter in the management of a railroad.

GRADING on the Stockton and Ione narrow-gauge road has been completed to Linden, Cal., 12 miles from Stockton, which will be the first division opened and operated. Eighteen miles of 40-lbs. iron has been purchased in Honduras, Central America, to arrive January 1, 1875. Cars of a new form of construction are being built by Mr. W. P. Hoyt, master car-builder. They are to be used for the coal-traffic, and for ordinary business of flat-cars. They are so constructed as to dump the entire load, when required, with ease, rapidity, and safety, by the use of a ball and socket joint, instead of the ordinary centre-plates and shifting chafe-blocks. They are 22 ft. long, 6 ft. 4 in. wide, and 2 ft. 10 in. high, and are considered superior to the ordinary flat-cars in use.

IN consideration of the unprecedented drought and the damage done to crops by grasshoppers in various localities in the vicinity of the Union Pacific road, in Nebraska, Superintendent Clark makes the proposition to transport, free, all donations of provisions and grain made to relieve absolute wants. He suggests that the counties on the line adopt some system which will insure the needed relief and prevent imposition.

THE first duty of an engineer, when he enters his boiler-room in the morning, is to ascertain how many gauges of water there are in his boiler. Never unbank nor replenish your fires until this is done. Accidents have occurred, and many boilers have been entirely ruined, from neglect of this precaution.

A RAILWAY Travelers' Protective Society has been established in England, having for its object the prosecution of railway companies through whose carelessness and bad management accidents and loss of life may occur.

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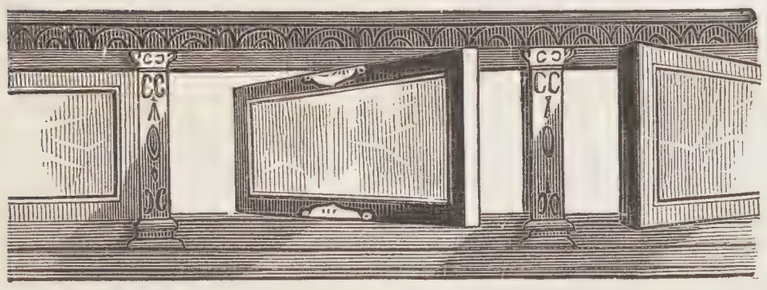

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We direct the attention of Car Manufacturers and others, to the valuable use to which the **Regulator** may be applied, in enabling the traveling public to have **Blinds** with **Movable Slats** upon railroad-cars. Hitherto the continual shaking of a vehicle in motion has rendered it necessary to construct blinds with stationary slats, thus obstructing the view, and admitting of no ventilation. The **Regulator** obviates these inconveniences by giving firm support to the slats, and holding them in any desired position.

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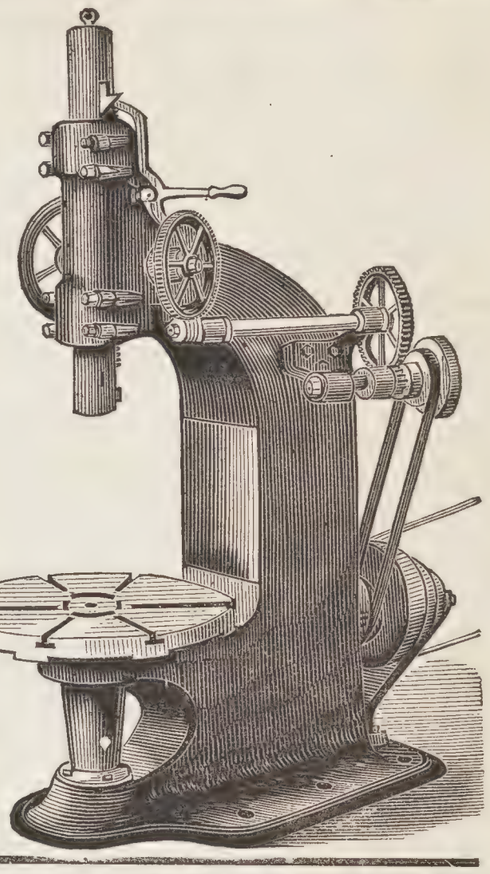

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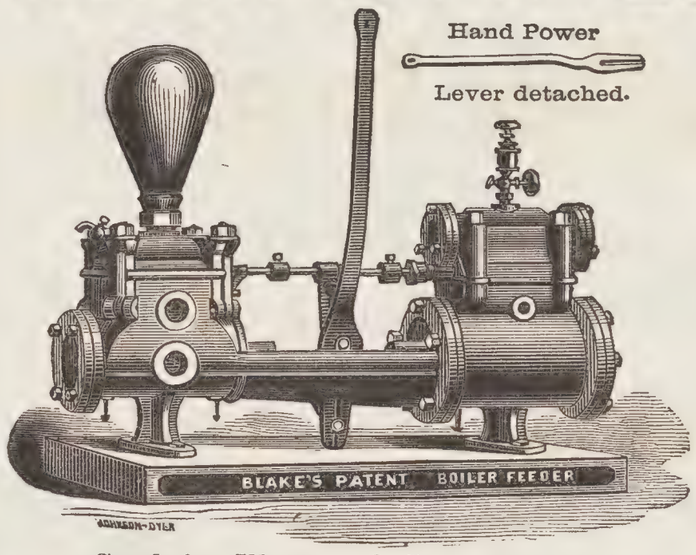

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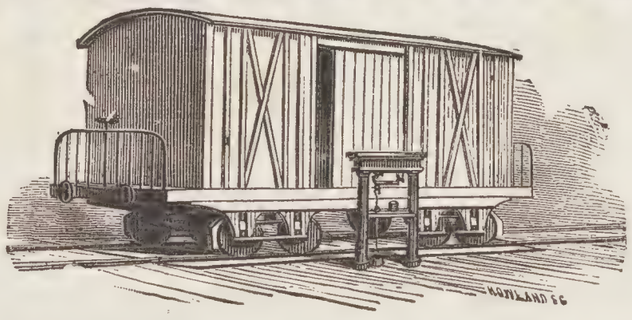

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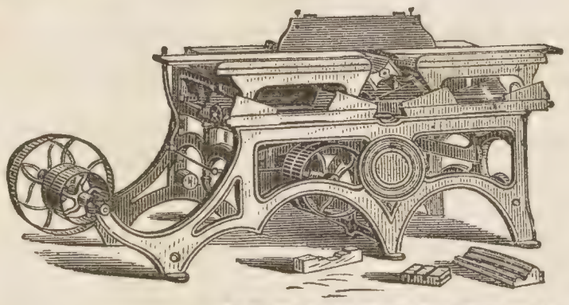

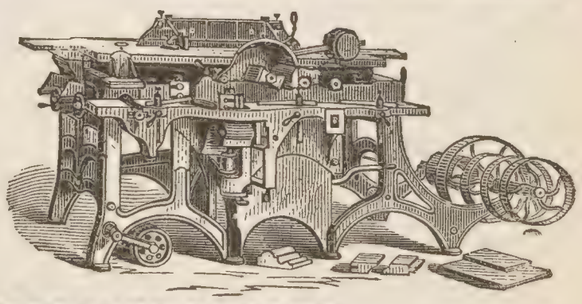

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B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack.	Baltimore, Md.
Baltimore & Ohio		James H. Miller	Baltimore. Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott	H. Longest.	Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
Central Ohio Division	Alex. Platt		Zanesville, Ohio.
S'dusky, Mans.. & New'k Div.	Wm Y. Johnson		Sandusky, Ohio.
Bangor, Old Town & Milford.	J. B. Peckham	John H. Brown	Bangor. Maine.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe.	H. D Landis	H D. Landis	Bellefonte, Pa.
Belvidere Delaware.	R McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D Adams	Springfield. Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W.E.Chamberlain	Allston, Mass.
Boston, Barre & Gardner	John Lover		Worcester, Mass.
Boston & Providence	George Richards.	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg. Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Eikins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D C. Richardson.	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis.	Nashua. N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville. Can.
Blue Ridge			Anderson. S. C.
Brunswick & Albany	M. Thornton		Brunswick, Ga.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer.	John Monks	Oil City, Pa.
C			
Cairo & Vincennes	R. Williams.		Cairo, Ill.
Calfornia Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal
Camden & Amboy	F. B Stevens		Hoboken.
	T. T. Kerr	E. Lockwood.	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills.	Camden, N. J.
Canada Southern and branches	‡‡C. E Benton	††C. E. Benton	St Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis.	Catawissa, Pa
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach	Catasauqua. Pa.
Carrolton & Oneida	M. T. Wiggins		Carrolton, Ohio.
Central of Georgia	D. D. Arden	C. C. Millar.	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas
Central R. R of Iowa	F. B. Woodruff	T. L. Seevers	Marshalltown, Iowa
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland, Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley	A. B. Seaman,	Sacramento, Cal.
Truckee Division	James Velsir	C. Lindsay	Truckee, Cal.
Humboldt Division	H. L. Stevenson	Chas. Thompson.	Carlin, Nev.
Salt Lake Division	J. G. McCuen	Thos. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D W. Haines	A. M. Corrie	Florence, S C.
Champlain Trans Co.	H. T. Calder		Burlington. Vt.
Cheshire & Ashuelot	F A. Perry	F. A. Perry	Keene. N. H.
Charlotte, Columbia & Augusta	Robert King.	J. C. Troeger.	Columbia, S. C.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell.	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago. Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba. Mich.
Chicago & Alton	John A Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender.	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm Wilson	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch.	Oliver Udell	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan		Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P.Du Chien Div		Wm E Kittredge.	Milwaukee, Wis.
Northern Div		John Baillie	Milwaukee, Wis.
Iowa & Minn Div	J. Pettee	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings. Minn.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cincinnati, Hamilton & Dayton	James Eckford.	W. H. H. Allison.	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie.	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster. Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cobourg, Peterboro & Marmosa	Wm Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus. Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M.W. Dickerman.	Concord, N. H.
Concord & Claremont	J. N. Lander.	A. Langmaid	Concord. N H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford. Ct.
Contoocook River			Concord, N. H.
Conn. & Passampsic Rivers	Geo. Kilby		Lyndonville. Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. NitterhouseChambersburg, Pa.	
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt Savage, Md.
D			
Dakota Southern	Jas Whitney	A. A. Meckling	Sioux City, Iowa.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht.	Dayton, Ohio.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Dayton & Michigan	William Cullen	W. H. H. Allison.	Cincinnati, Ohio.
Denver & Rio Grande	John Greenwood		Denver, Col.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa
Morris & Essex Division	W. H. Lewis	L S. Barber	Hoboken, N. J.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit. Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson CanalCo	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G.Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee & Virginia	Eli Hixon	Jos. Armbruster	Knoxville, Tenn.
East Tennessee & Georgia	Eli Hixon		Knoxville, Tenn
Erie Railway	§§Frank K. Hain		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	W. E. Cooper	Hornellsville, N. Y.
Erie Railway	‖D. B. Goodell	Wm. Moffet	Elmira, N Y.
Erie Railway	‖‖David Holtz		Jersey City, N. J.
Erie Railway	J. Van Vechten		Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
European & North Am. (of Maine)	A O. Bailey	J. H. Brown	Oldtown, Maine.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin.	Erie, Pa.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flint & Pere Marquette	Sanford Keeler.	‖R. B. More	East-Saginaw, Mich.
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown. Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale.	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Galveston, Houston & Henderson	Jno G. Coulon	Wm. Macbeth	Galveston, Texas.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne. Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Georgia	William Hardman.	T. M. Preval	Augusta, Ga.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Harlem Extension	George W. Blanchard		Rutland. Vt.
Harlem Extension		C. S. Clapp	Bennington, Vt.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover. Pa.
Hannibal & St. Joseph	**H. L Cooper		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Housatonic	C. R. Morris	J J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas McGee	Houston, Texas.
Houston Tap & Brazoria	A. H. De Clercq	A. H. De Clercq	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton. Pa.
Hempfield	T. Marsh		Wheeling, Va.
I			
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Illinois Central	**S. J. Hayes.	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia. Ill.
North Division	J B Edams		Amboy, Ill
Iowa Division	Thomas W. Place		Waterloo. Iowa.
Iron	Perry Scott.	Clem. Roetling	Ironton, Ohio.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon. Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	A. H. DeClercq	A. H. De Clercq	Hearne, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kansas Central	John Davis		Leavenworth, Kan.
Keokuk & Des Moines Valley	S. W. Wakefield.	M. Sessions	Keokuk, Iowa.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath. Maine.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington. Ky.
Knoxville & Charleston			Knoxville, Tenn.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div.	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte. Kansas.
Arkansas Valley Div.	**L. H. Waugh		Wyandotte, Kansas.
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
King's Mountain	E. Thomas.	E. Thomas	Chester, S. C.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
L			
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lehigh Valley	John I. Kinsey		South-Easton, Pa.
Lehigh Valley	P. Hofecker	E. R. Brown	Weatherly, Pa.
Lehigh Valley	A. Mitchell	Mauch Chunk, Pa.	Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville. Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk. Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo, N. Y.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, Ky.
Lake Superior & Mississippi	**H. A. Towne		St. Paul, Minn.
Lake Shore & Tuscarawas Valley	W. F. Turreff	J. D. McIlwain	Black River. Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.
M			
Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Macon & Augusta			Macon, Ga.
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Maryland & Delaware	J. L. Caldwell		Easton, Md.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Midland Pacific	A. C. Stiles		Lincoln, Neb
Milwaukee & Northern		W. J. F. Liddell	De Pere, Wis.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G W. Reynolds	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox.	Henry Fox.	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford		Wortendyke, N.J.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey.	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan.	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany. N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc.,N.Y
New-York & Oswego Midland			Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden.	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson.	Jas H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D. Billings	McComb City. Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest.	York, Pa.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
O			
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott		East St. Louis, Ill.
Oregon & California	§§J. Brandt.		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Pacific of Missouri	§§John Hewitt	E. Martin	St Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L Caum	Samuel W. Myers.	Harrisburg, Pa.
Pennsylvania	G W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver.	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division.		David H. Baker.	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman.	Wm. T. Worth	Wilmington, Del
Philadelphia & Baltimore Central	S. D. Danfield.	Samuel D. Danfield.	Chester, Pa.
Philadelphia and Erie.	Martin Walls		Sunbury, Pa.
	W. L Forster		Renovo, Pa.
	W. L. Holman		Kane. Pa.
	W. T. Smith.		Erie, Pa.
	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce		Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division	J. H. Setchel		Cincinnati. Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg. Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns.		Connellsville, Pa.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl.	Pekin, Ill.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland. Me.
Port Royal	Wm. Campbell	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific			Quincy, Ill.
R			
Raleigh & Gaston.			Raleigh, N. C.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder.	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Lawrence & Ottawa	Calvin Dame.	Calvin Dame.	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
South Side of Long Island	A. P. Doane	A P. Doane	Williamsburg, L. I.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Stonington & Providence	J. H. Anderson.	J. H. Anderson	Providence, R I
Selma & Gulf	Wm. T. Laughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Mames	W. W. Peirce	Selma, Ala.
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mas.
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan. Wis
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N. Y.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	H. H. Osborne		Edgefield, Tenn.
St. Louis, Kansas City & Northern.	H. S. Smith	C. S. Buck	St. Louis, Mo.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
T			
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		A. M. Collett	Omaha. Neb.
Eastern Division		H. P. Makely	Grand Island, Neb.
Mountain Divison		Jno. E. Davis	Cheyenne, W. T.
Laramie Division		Floyd Heavaner	Laramie, W. T.
Western Division		C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Rutland Division	N. L. Davis		Rutland, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short.	J. R. Ames	Malone, N. Y.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
W			
Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
Western Maryland	Wm. Cannan	J. H. Nussear	Union Bridge, Md.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
West-Wisconsin	L. T. Mead	J. L. Adam	Hudson, Wis.
Worcester & Nashua	Albert Griggs	Albert Griggs	Worcester, Mass
Welland	James Taylor	James Chase	St. Catharine, C. W.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.
White Water Valley	A. W. Britton		Harrison, Ohio.

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
A			
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	C. C. Smith	Atchison, Kansas.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.
B			
Baltimore & Ohio	Thos. R. Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	W. C. Quincy		Columbus, Ohio.
Baltimore & Potomac	J. N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss.		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W. W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.
C			
Cairo & St. Louis	C. Hamilton		St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	Webster Snyder	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee, Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	W. C. Wickham	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	C. H. Hudson		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota		F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen	Alfred Penny	Chicago, Ill.
Chicago & Paducah	Q. A. Stephenson	Q. A. Stephenson	Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle.	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore		Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	—— Slocumb	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	E. H. Waldron	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	Charles Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley			Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.
D			
Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus. Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese	C. D. Childs	Detroit, Mich.
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V. DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.
E			
East Alabama & Cincinnati	B. Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	E. S. Bowen		New-York City.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
Erie Railway,		Henry Bowman	New-York City.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.
F			
Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Shore	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.
G			
Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada.
Green Bay & Lake Pepin			New-York City.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.
H			
Hannibal & St. Joseph	L. W. Towne	A. W. Lamb.. W. J. Hilton.. L. W. Morse..	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.
I			
Illinois Central.	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.
J			
Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.
K			
Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific			Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Kentucky Central	G. H. Pendleton.	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs	Geo. H Griggs	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.
Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.
Lackawanna & Bloomsburg		G.W. B. Cushing.	New-York City.
Lake Erie & Louisville	I. H. Burgoon		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. L. Holden	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong.	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell	R. B. Gemmell	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	F. N. Finney		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn.		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	Sam. Gill	E. C. McMichael.	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker.	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	J.W. Robertson	J. W. Robertson.	Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch.	S. Schoch	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell	J. L. Caldwell	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. B. Greenlaw	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago. Ill.
Michigan Central	J. R. Ledyard	John Newell	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers.	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb.	G. W. Cobb	Mineral Point, Wis.
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells.		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas		G. M. Babcock.	Sedalia, Mo.
Cherokee Division	L. S. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	A. L. Rives.	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans.	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury.	W.A. Waterbury	Middletown, Ct
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson.		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest.	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews.		Worcester, Mass.
New-York & Oswego Midland.	C. W. Douglas	P. Bundy	New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed.		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews.	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben.	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead.	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division.	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	A. R. Fiske		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.
P			
Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black.		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pensacola & Louisville	L. H. Sellars		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch.	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa
Philadelphia & Erie	W. A. Baldwin		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis.	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr	Wm. Mullins.	Pittsburg, Pa.
Pittsburg & Cin. Division	S. M. Felton, Jr		Pittsburg, Pa.
Little Miami Division	J. D. Ellison.		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft. Wayne & Chicago	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase.		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberliu		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers.	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw.		Richmond, Va.
Rockford, Rock Island & St. Louis	R. R. Cable		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lineoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper.	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. W. Gardiner	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Nashville, Tenn.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	J. L. Hinkley		St. Louis, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson.		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac, Wis.
Shenango & Allegheny	A. L. Dunbar		Meadville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick.		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I.
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne.		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield, Illinois & South-Eastern	*C. A. Beecher		Springfield, Ill.
Staten Island	J. W. Wlbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter.		Coalville, Utah.
Syracuse Northern	J. W. Moak		Watertown, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing.	Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson	C. R. Peddle	Indianapolis, Ind.
Terre Haute, Paris & Decatur	D. Hitchcock	P. Campbell	Terre Haute, Ind.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble	Wm. Mahl	Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria & Warsaw	Jas. C. Clarke	Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio.
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City.
Utica & Black River	J. F. Maynard		Utica, N Y.
Utica, Ithaca, & Elmira.	H. P. Goodrich		Ithaca, N. Y.
V			
Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
New-London Northern	G. W. Bentley		New-London, Ct.
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden, N. J.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic	Wm. McRae		Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Wisconsin Central	C. Harris		Milwaukee, Wis.
Worcester & Nashua	C. S. Turner	C. S. Turner	Worcester, Mass.

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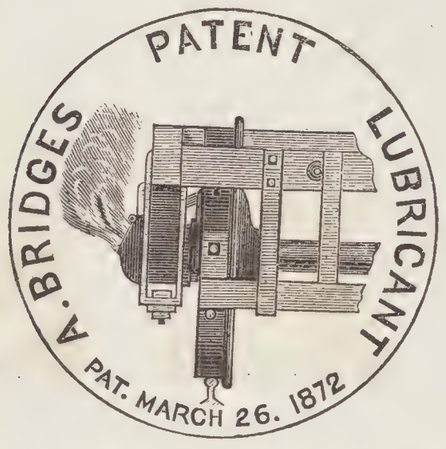

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In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,

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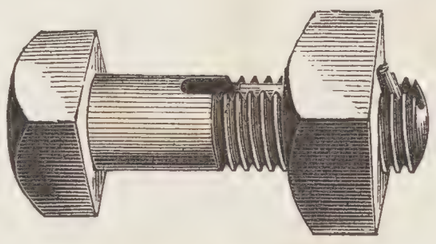
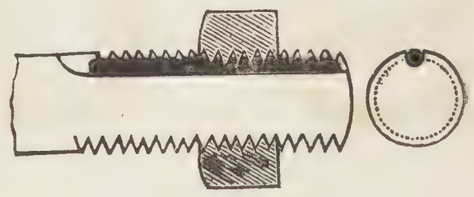


"CUMMING NUT-LOCK,"
Patented
June 16, 1868,
August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

JOS. W. SPRAGUE, Pres't and Sup't. **W. CRICHTON, Jr., Sec'y and Treas.**

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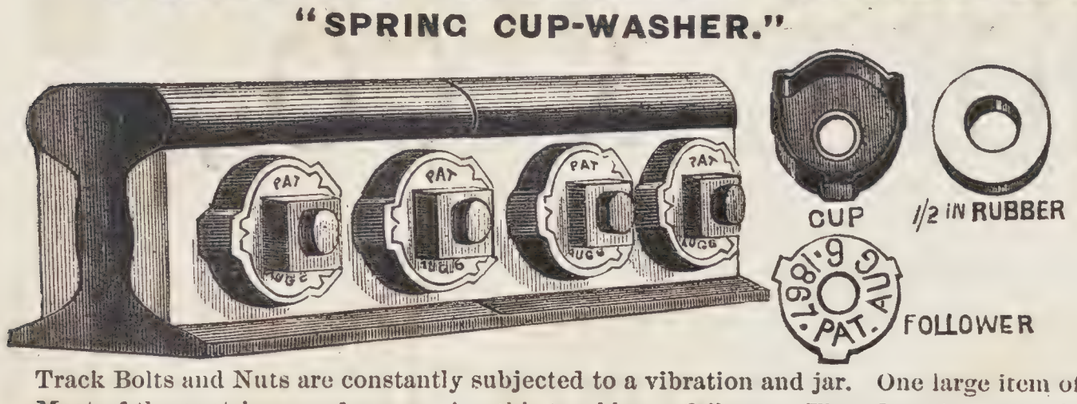
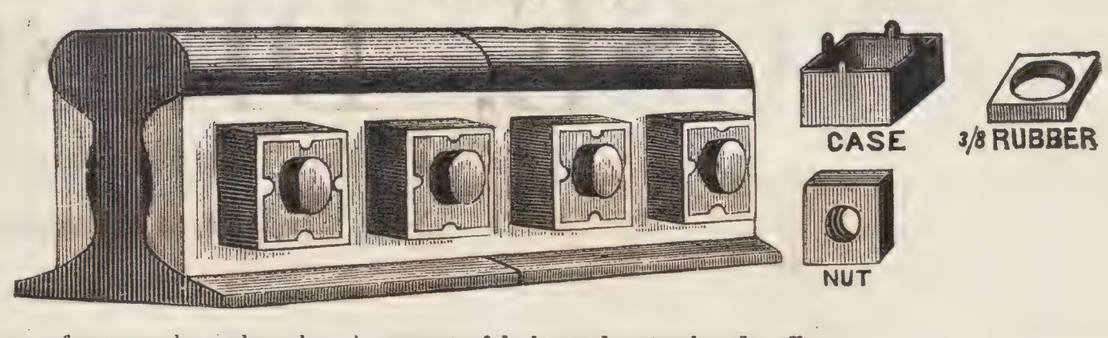


"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

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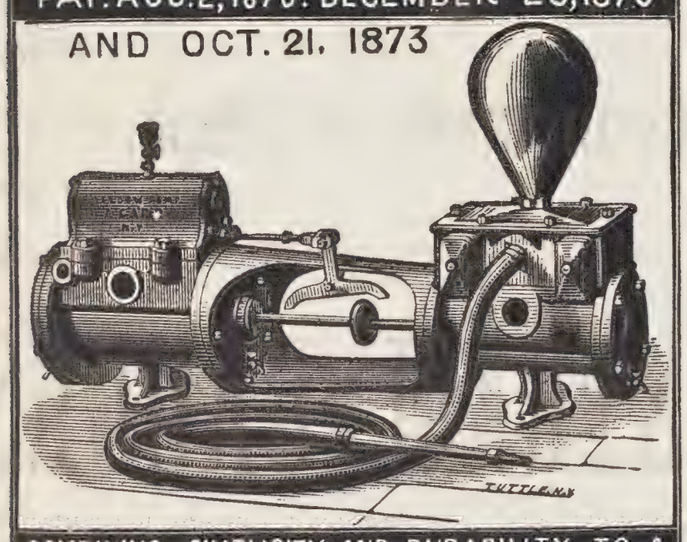

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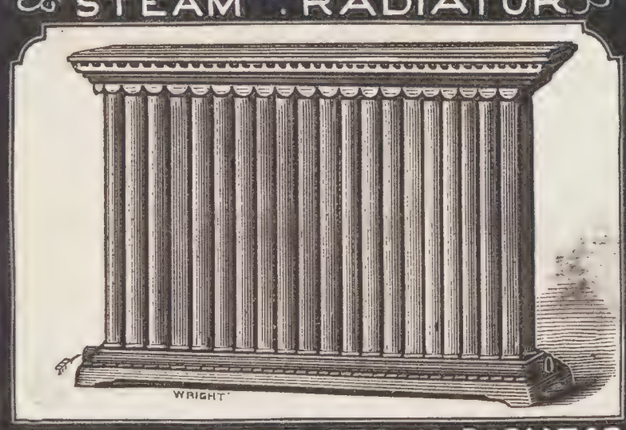

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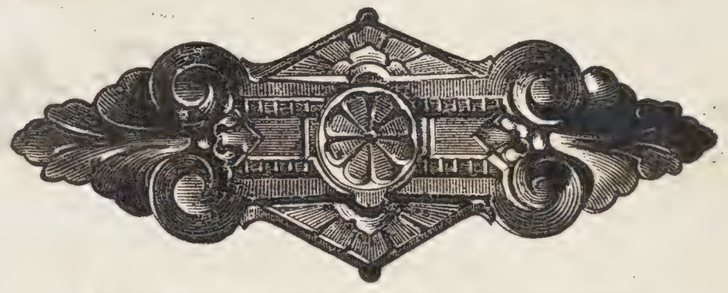

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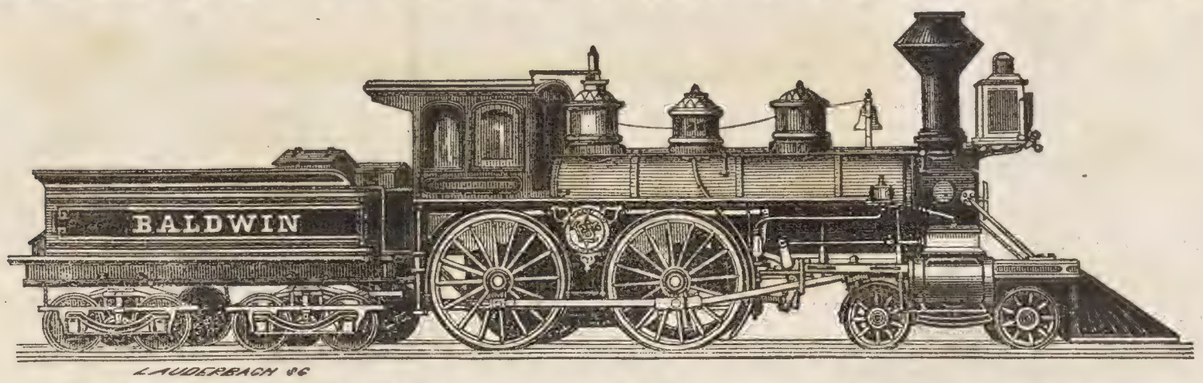

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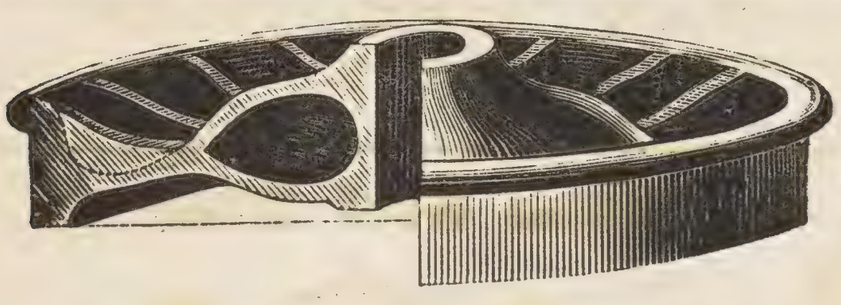

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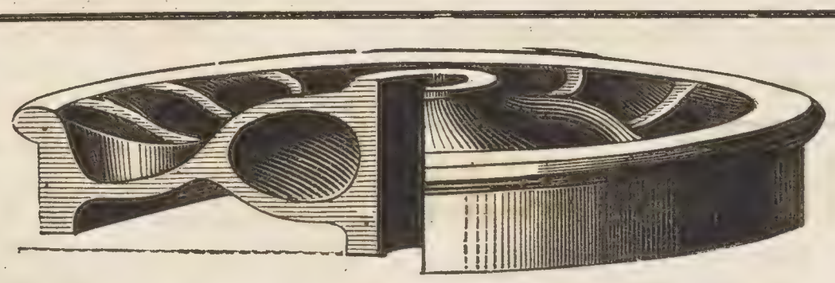

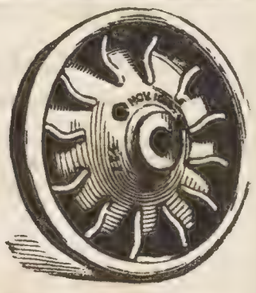

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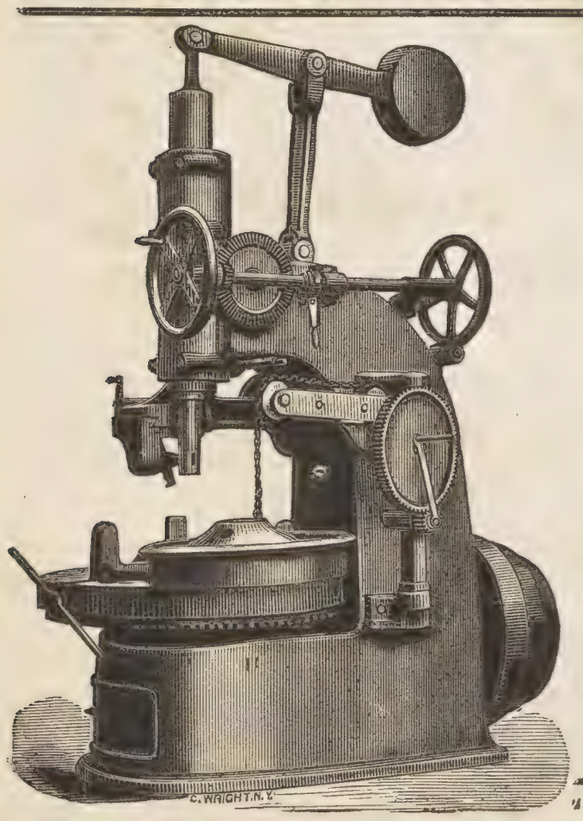

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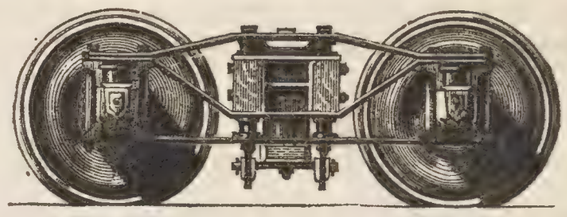

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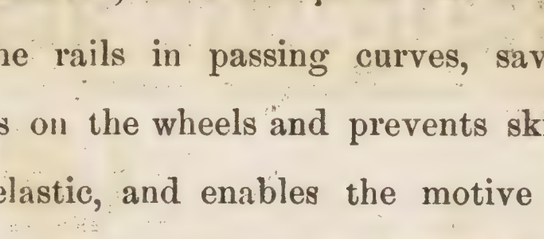

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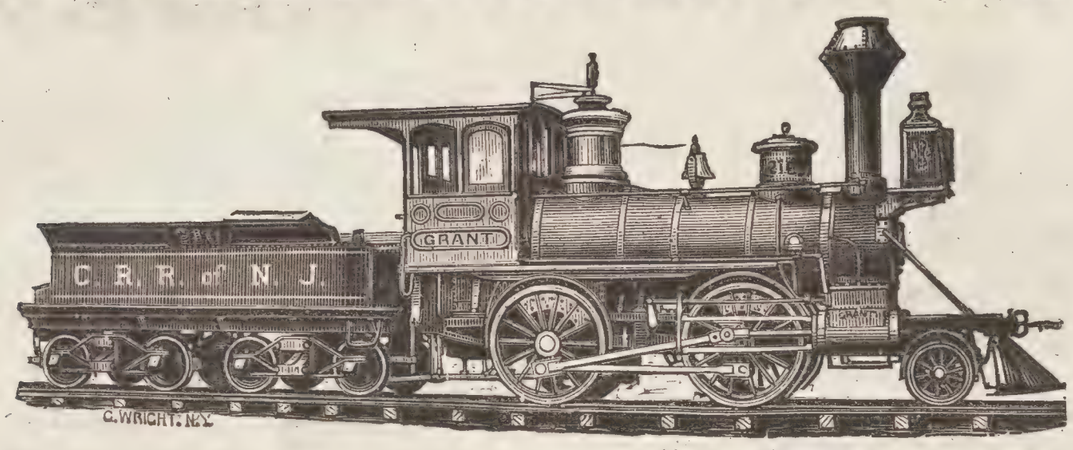

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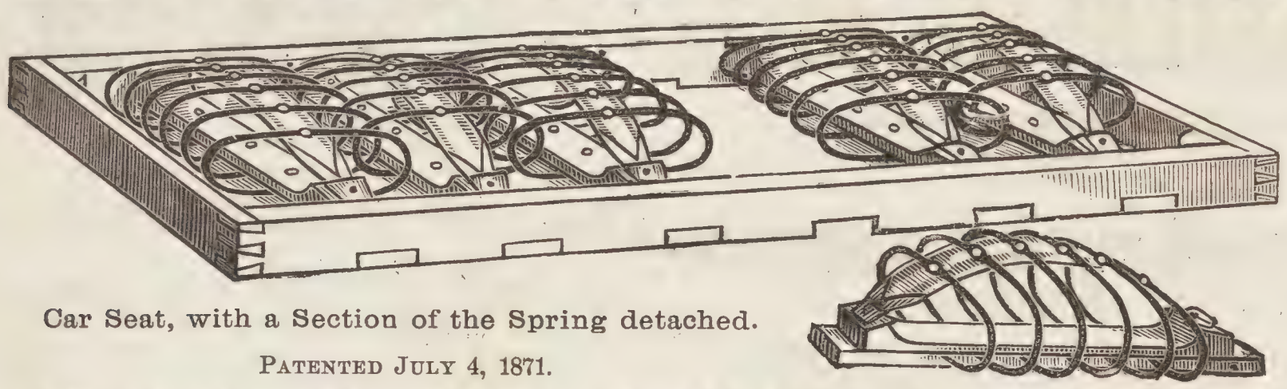

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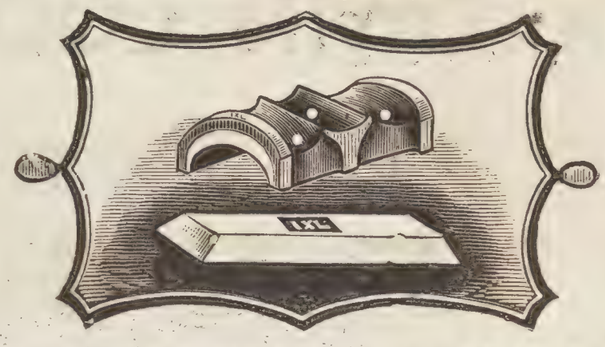

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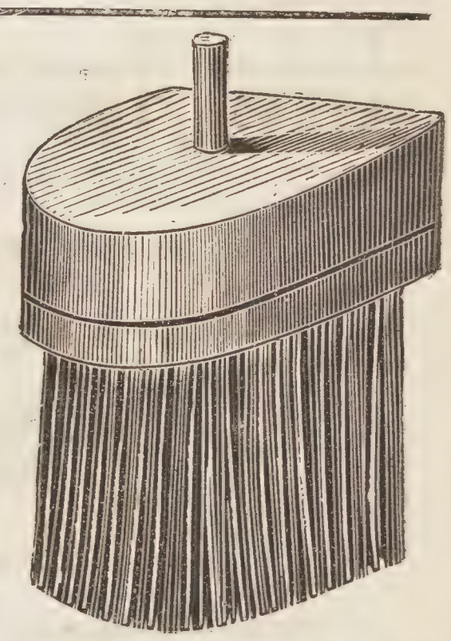

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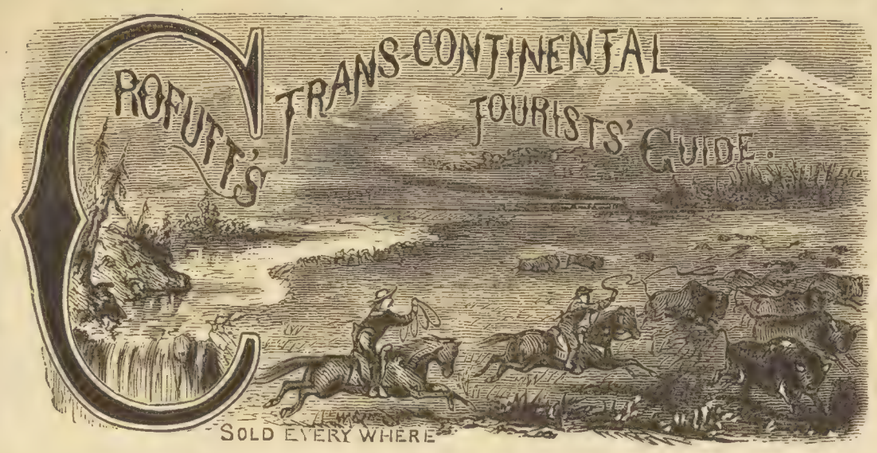

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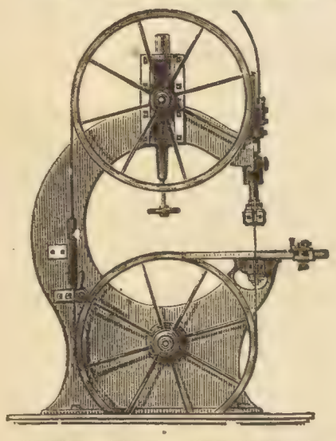

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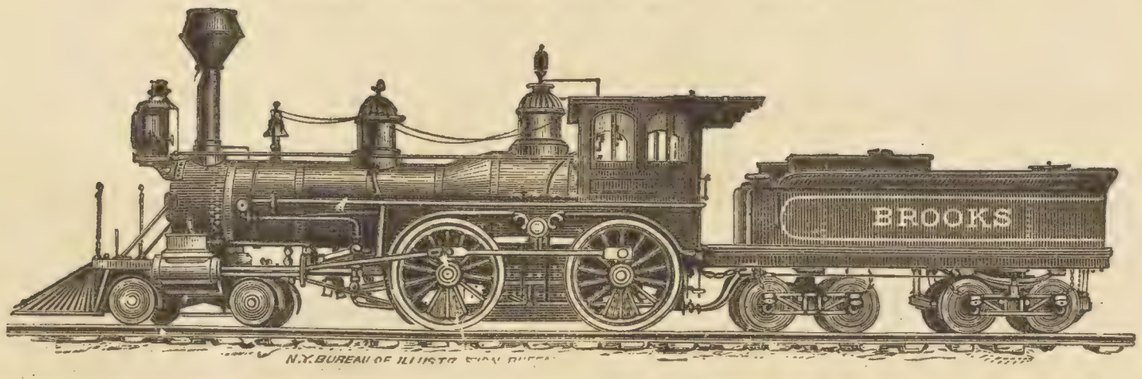

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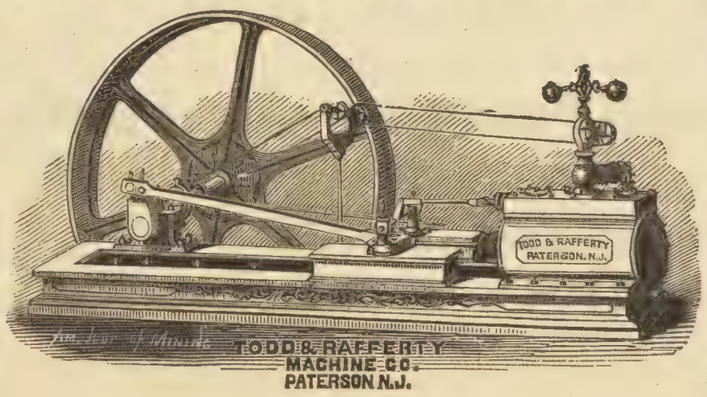

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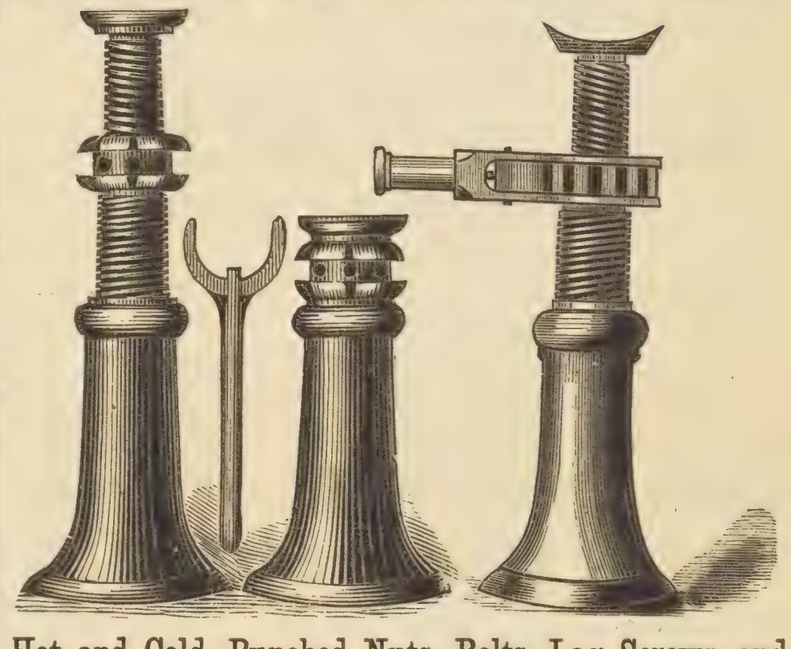

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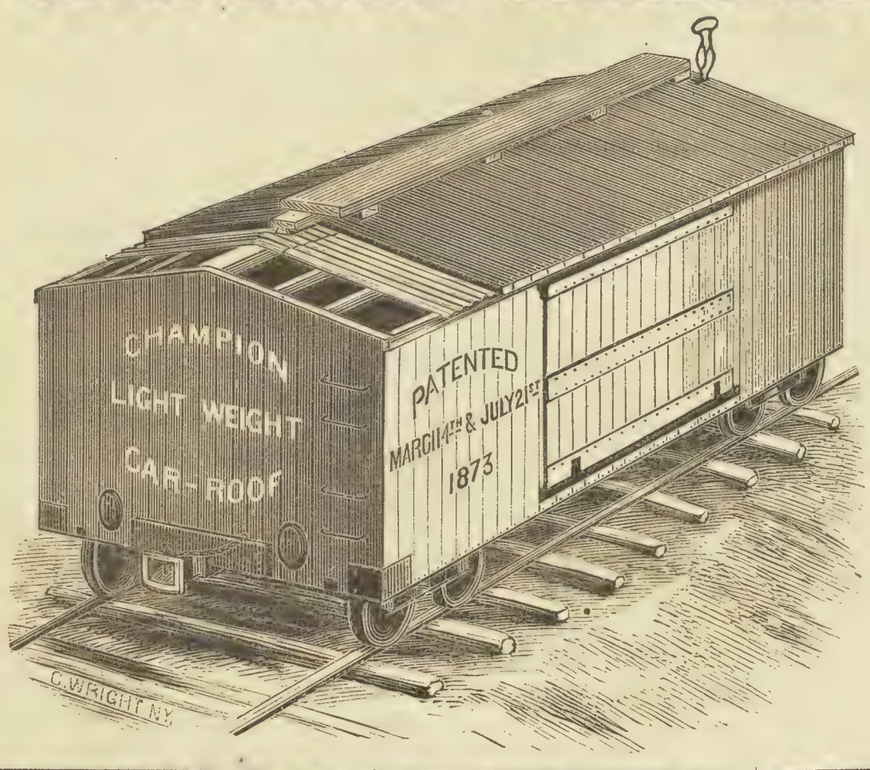

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A. S. TAYLOR & CO.,

63 AND 65 ELIZABETH ST., NEW-YORK,

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Suitable for Car Builders' Use.

Also calls attention to his stock of

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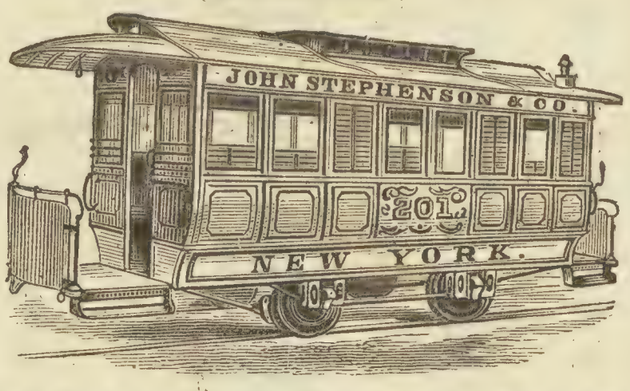

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Over 28,000 Cars now in service covered with this roof. It will last, without repairing, as long as the car it covers, and is more economical by one half than any roof in use.

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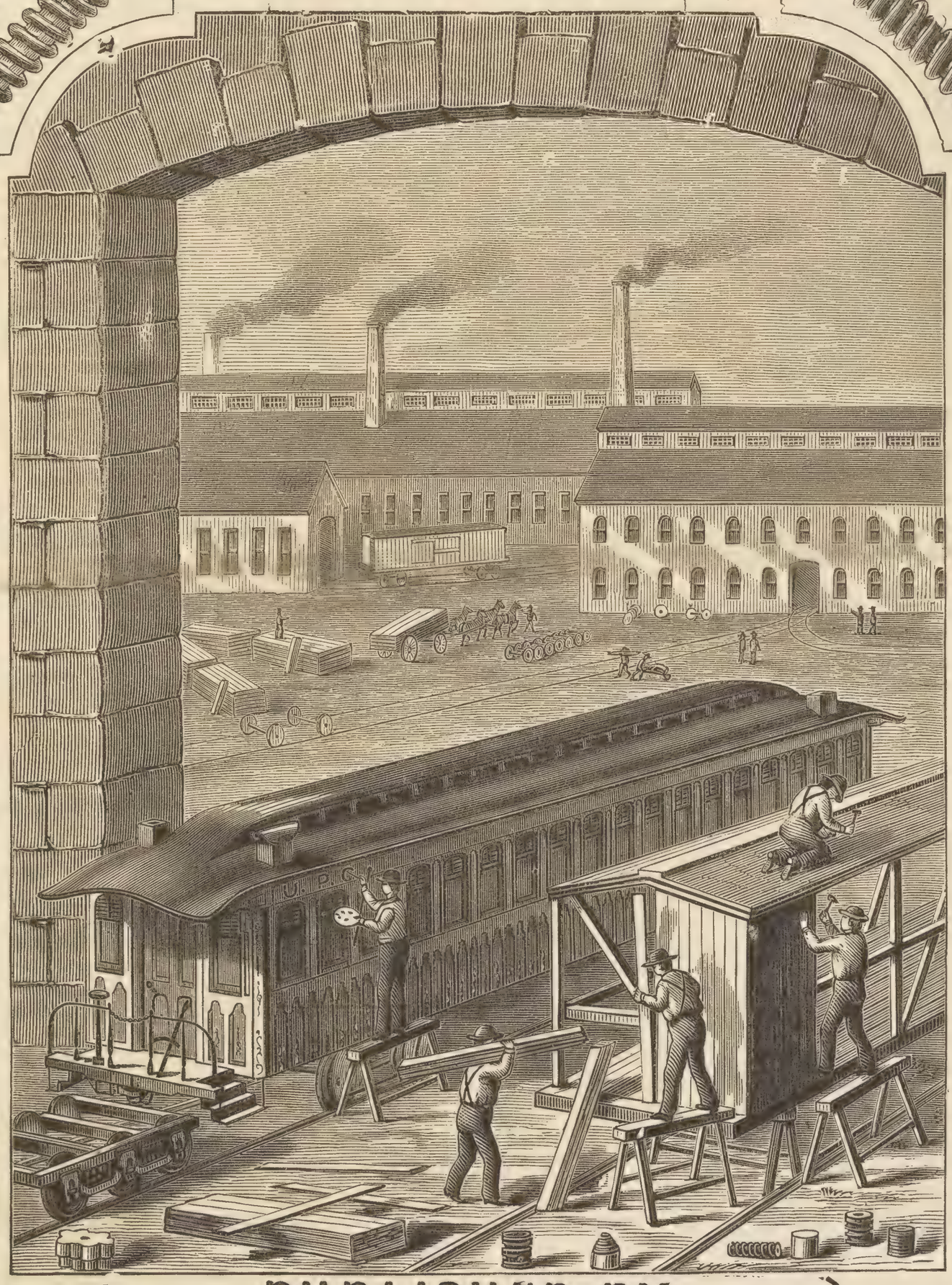
Vol. V. DECEMBER, 1874. No. 12.



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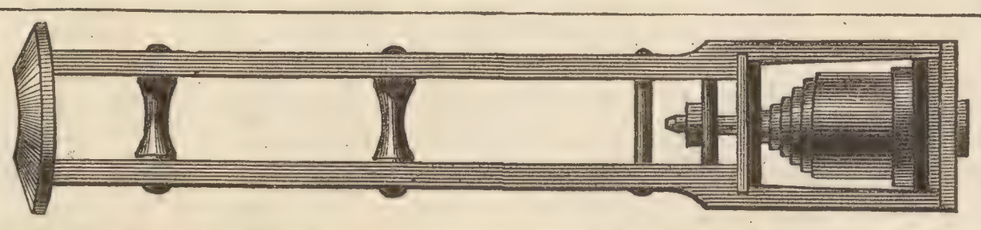

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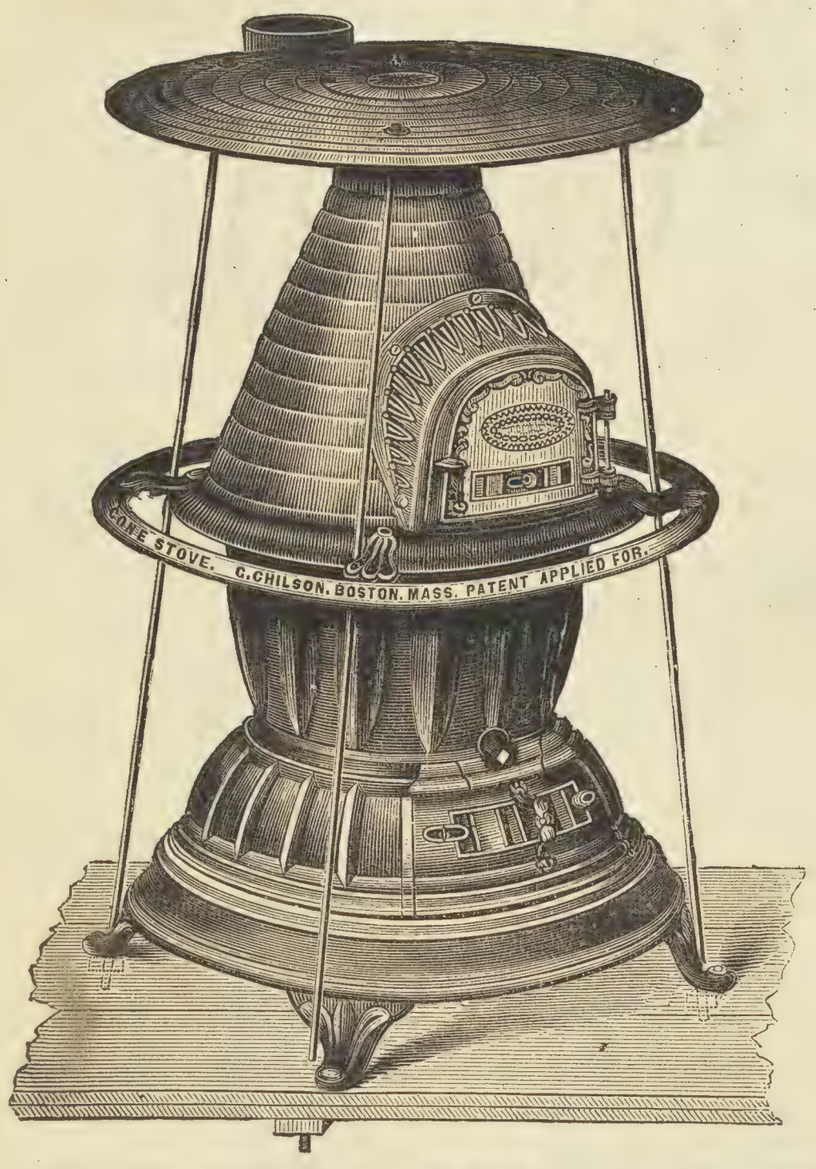
A NEW RAILWAY CAR STOVE.

Chilson's Patent Cone Disk Stove

ON A NEW AND MODEL PLAN.



I WOULD respectfully call the attention of Railway Managers and others interested in warming Railway Cars, Station Houses, etc., to this Stove, which has been thoroughly tested on several of our railways for a few years past, and has proved in every instance the most successful plan yet devised for thoroughly warming Railway Cars. This Stove is on a new and model plan, differing in principle and operation from all others in the United States. I claim for it *Safety*, *Economy*, *Durability*, *Simplicity*, *Cleanliness, and Beauty of Design.* Its peculiar merits may be stated as follows:

1. The conical radiator holds the hot smoke and gases back near the fire until they are thoroughly consumed, and the heat is rapidly radiated from the tapering surface of the cone.

2. The broad radiating disk prevents the heat from ascending to the upper part of the car or room, but distributes and throws it down to the floor, thoroughly warming the lower currents of cold air in the car or room for a great distance around the Stove, thus securing the long desired object of making the *lower part of the car and floor comfortably warm, especially for the feet.*

3. It is constructed in the most substantial and durable manner, from a new and beautiful design, wholly of *cast iron*, hence is not subject to the repairs of common stoves.

4. It is perfectly *safe*, being well secured against *accidental fires by being bolted down to the floor and having locks on the doors, so that in case a car should be overturned, fire could not get out of the Stove.* The guard rail which supports the feet when warming them, also serves as a fender, preventing the clothing from coming in contact with the Stove.

5. There is no hearth for dirt, filth, and tobacco spittle to accumulate on, which insures *cleanliness around the Stove.*

6. This Stove keeps the fire for a long time, and although adapted for coal, yet wood can be burned in it equally well.

It will be highly appreciated by all in want of a superior heater for *Factories, Stores, Offices*, RAILROAD CARS, and STATION HOUSES, *School Rooms, Workshops, etc.*, and has especially proved itself to be the most successful plan yet devised for warming RAILROAD CARS.

The BOSTON AND PROVIDENCE RAILROAD COMPANY have over two hundred of these Stoves in use, and the BOSTON AND ALBANY and several other Roads are adopting them, with the most perfect success.

BOSTON AND PROVIDENCE RAILROAD CORPORATION,
Superintendent's Office, Boston, April, 1873.

GARDNER CHILSON, Esq.: *Dear Sir:* We have about two hundred of your new "Cone" Disk Stoves in use, (a part of them for nearly five years,) for warming Passenger Cars and Stations. I can truly say that they have given entire satisfaction. These Stoves possess many important advantages over any other we have ever used, viz.: for warming the floor and displacing the cold air in the lower part of the car, whereby they are rendered much more comfortable, especially for the feet, than by any other plan known to us. The Stove is more economical in the consumption of fuel, more substantial in construction, and consequently requiring less repairs than any other in use, and so securely constructed as to prevent fire from getting out of the stove even should the car be *overturned.* I cheerfully give my testimony in favor of this Stove, and commend it to all Railroad Managers.

Yours, etc.,
A. A. FOLSOM, *Superintendent.*

Numerous other testimonials received from Railroads and other persons having these Stoves in use in Halls, Stores, etc., may be seen at office. Bolts are not required except for Cars and Steamboats.

Chilson's Improved Celebrated Cone Furnaces, for setting in Brickwork or in Portable Casings, Chilson's Unrivaled Double-Oven Brick Cooking-Range; Chilson's New and Splendid Arlington Portable Range; Chilson's very Superior Arlington Cooking Stove; Parlor, Office, and Store Stoves, Parlor Grates, Registers, Ventilators, etc.

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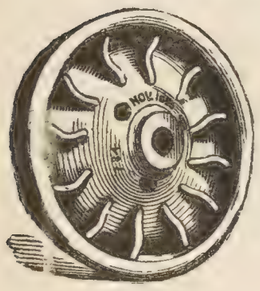

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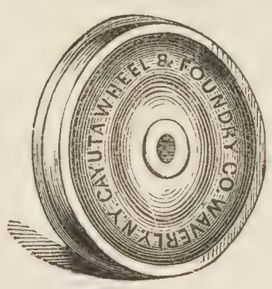

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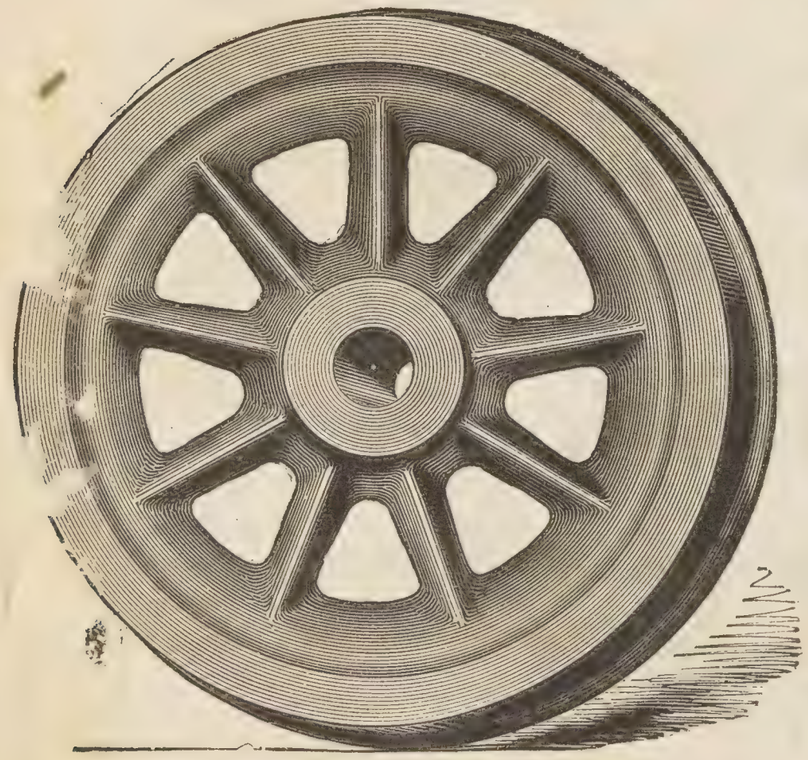

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MADE TO ORDER,

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TODD'S

Patent Coupling,

FOR FREIGHT CARS.

First. It is self-coupling; perfectly simple; requires no pins; always sure and couples readily with any car having the ordinary draw-bar.

Second. The expense is but a trifle more than the ordinary coupling, and will be saved in pins and links alone in a very short time, there being a link always in reserve, ready for use, without liability of being lost or stolen.

Third. The saving of time is also a great consideration, as the engineer alone can couple a train of cars in much less time than with the aid of two or three men with the ordinary coupling.

Fourth. There is no going between the cars to shackle or unshackle; *it is entirely safe, always ready, always sure.* To companies desirous of testing the coupling, one or more castings will be furnished gratuitously, for trial.

The Boston and Albany Railroad Co., after a thorough trial, being satisfied of its utility, have purchased the right for their road, and we are permitted to refer to the officers and employés of the road, who have given attention to it.

For further information respecting it, address *William Todd,* or

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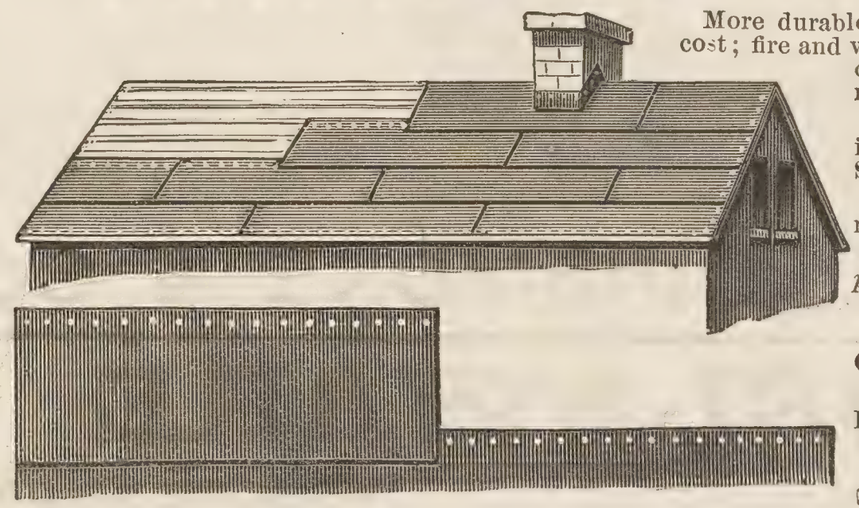

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Unequaled for Covering Railroad Cars and Steamboat Decks.

Can be laid by inexperienced persons.

Roofing Shipped to any part of the Country.

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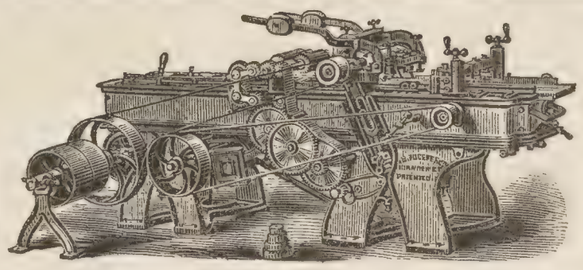
Steam Hammers, Drops, &c. Engine Lathes, Axle Lathes, Cut-off and Centering Lathes, Patent Screw-Cutting Lathes, Planing and Slotting Machines, Wheel Borers and Wheel Pressers, Upright Drills, with Patent Universal Tables, Radial Drills.



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Scale in Steam Boilers.

I WILL REMOVE AND PREVENT **SCALE** IN ANY STEAM BOILER, AND MAKE NO CHARGE UNTIL THE WORK IS FOUND SATISFACTORY. ADDRESS, GEO. W. LORD, PHILADELPHIA PA.

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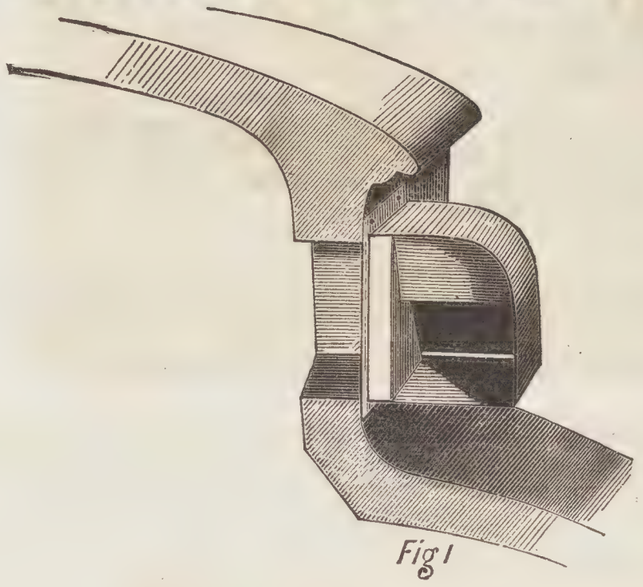


Fig 1

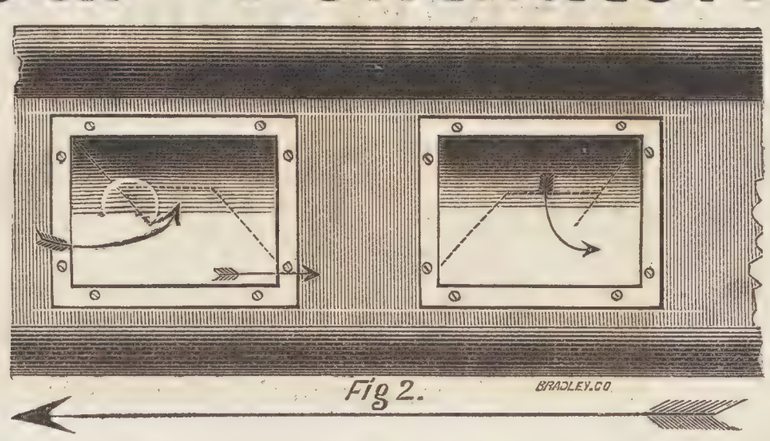


Fig 2.

THE Ventilators are placed as usual in the car roof as shown in Fig. 1, their mouths facing alternately in opposite directions, those facing forward admitting the air, and those facing backward affording an exit. Fig. 2 represents a side section of the raised roof with two of the ventilators alternately arranged. When the car is moving in the direction indicated by the arrow, it will be seen, by the curved darts, that there is an ingress and egress of air constantly taking place. The operation of the ventilators is reversed with precisely the same effect, when the car moves in the opposite direction. The internal structure is such that the dust and cinders passing into the mouth of the ventilator are intercepted by striking against two shields, shown in Fig. 1, and indicated by dotted lines in Fig. 2, and are thus naturally thrown to the bottom, where they are carried out through a small opening as shown in Fig. 1, and by the straight dart in Fig. 2, a current of pure air being forced into the car at the same time through a lateral opening. The faster the car moves, the greater is the quantity of air admitted and expelled, thus securing a free circulation which does not subject the occupants to a direct current or draught. The ventilator is also noiseless in its operation. There is no clattering of valves, and no change is necessary when the car reaches its destination. Once put in place, it is always in readiness, and runs itself independent of all employees.

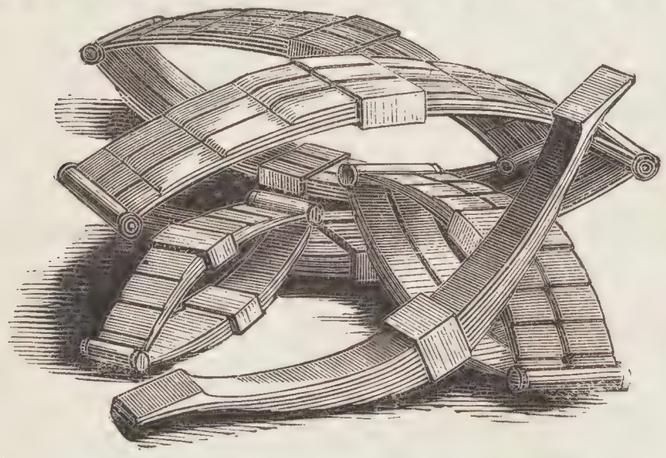
H. D. CARROLL & CO., Springfield, Mass.,

Proprietors and Manufacturers.

ROBERT HITCHCOCK, Inventor.

HALF AND FULL CAST-STEEL

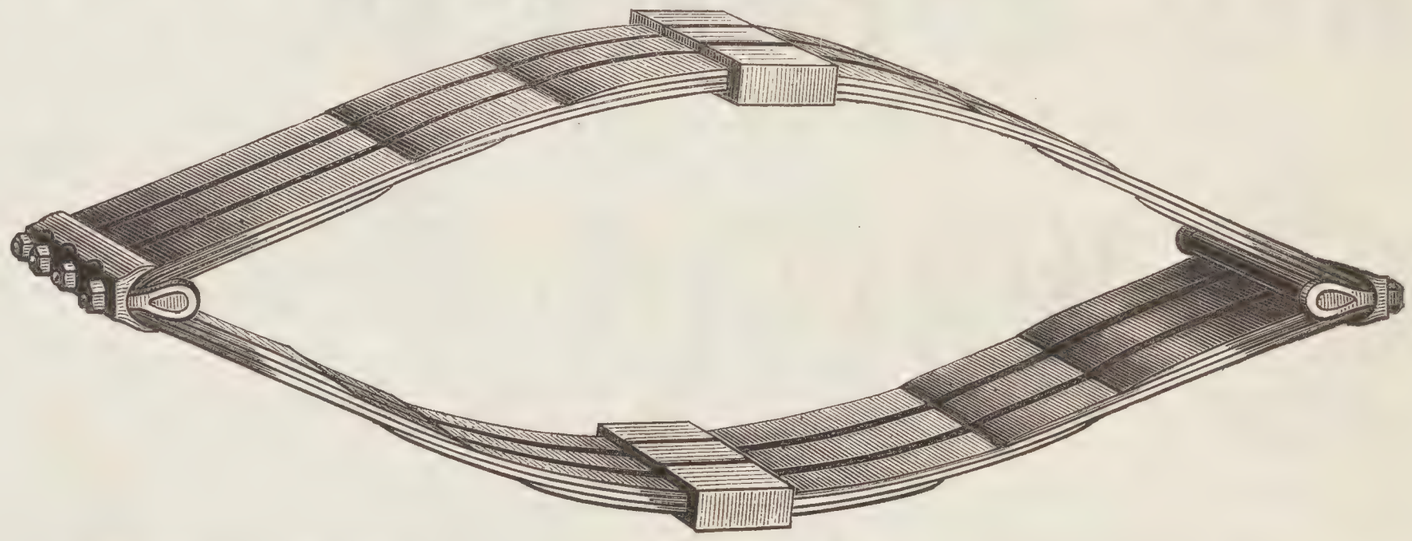
ELLIPTIC SPRINGS.



Our own manufacture; light, extra tempered, and made of best material. Equal to any in the market.

CLIFF'S PATENT ELLIPTIC CAR-SPRING,

For Freight or Passenger Service.



A continous leaf or bed-plate upon which all the short leaves work, securing a uniform pressure. Equally durable with ordinary elliptics, and saves thirty per cent of dead weight. In successful operation on a number of roads. Made of best cast steel. CHEAPER, LIGHTER, MORE ELASTIC.

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DELAWARE CAR WORKS.

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STEAM GOVERNORS WITHOUT COST,

WHEN THEIR SUPERIORITY OVER ALL OTHERS AS THE MOST PERFECT, RELIABLE AND ECONOMICAL

STEAM GOVERNOR IN THE WORLD

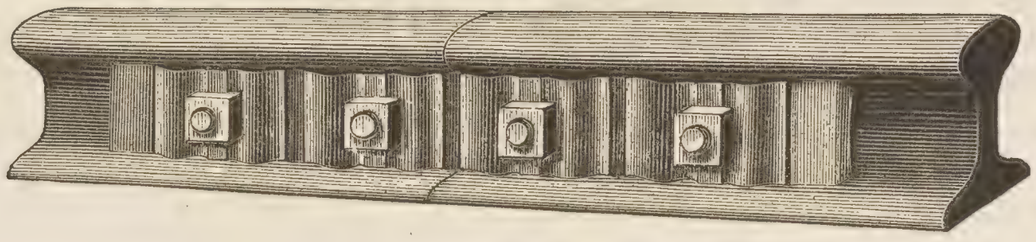
IS NOT FULLY ESTABLISHED BY ACTUAL TEST.

They differ from all others both in principle and operation, and insure any desired uniform speed under all variations of load or boiler pressure. Largely in use by the U.S. Government at Treasury Department, State and Custom Houses, Navy Yards, &c.; also, by leading Manufacturing Establishments, Rolling, Saw and Paper Mills, Tanneries, &c., throughout the country, where the most positive and uniform speed is required. Address, for descriptive circular of reference, &c.,

HUNTOON GOVERNOR Co., Lawrence, Mass.

MILLER'S PATENT ELASTIC WASHER AND NUT LOCK,

FOR RAILROAD FISH JOINTS.

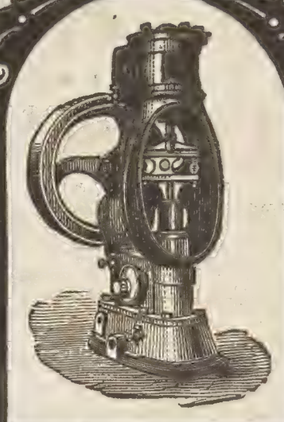


NUT SCREWED DOWN. SCREWED DOWN AND NUT LOCKED.

These are OIL-TEMPERED CAST-STEEL SPRINGS, so formed as to be AUTOMATIC, locking the nuts firmly, and COMPENSATING FOR EXPANSION AND CONTRACTION AND THE STRAIN AND CONCUSSION OF MOVING TRAINS, maintaining at all times the tension on the bolts and holding the plates tight to the rails. THEY ARE APPLICABLE TO ALL SPLICE JOINTS NOW IN USE WITHOUT CHANGE OF PLATES OR BOLTS, and can be applied or removed as often as may be desired without injury to them or the bolts or nuts. They have been tested by a number of heavily-operated Railroads, and pronounced superior to all other fastenings heretofore submitted to them. They are put up in boxes, each containing 500 washers, weighing about 150 pounds. Orders, stating width of plates and the thickness of bolts, respectfully solicited and promptly filled.

Address *SWEETS MFG. CO., Syracuse, N. Y.*

BUCKET PLUNGER



VALLEY MACHINE CO. EAST HAMPTON MASS.

STEAM PUMP

CARS FOR SALE.

The Ohio Falls Car Company,

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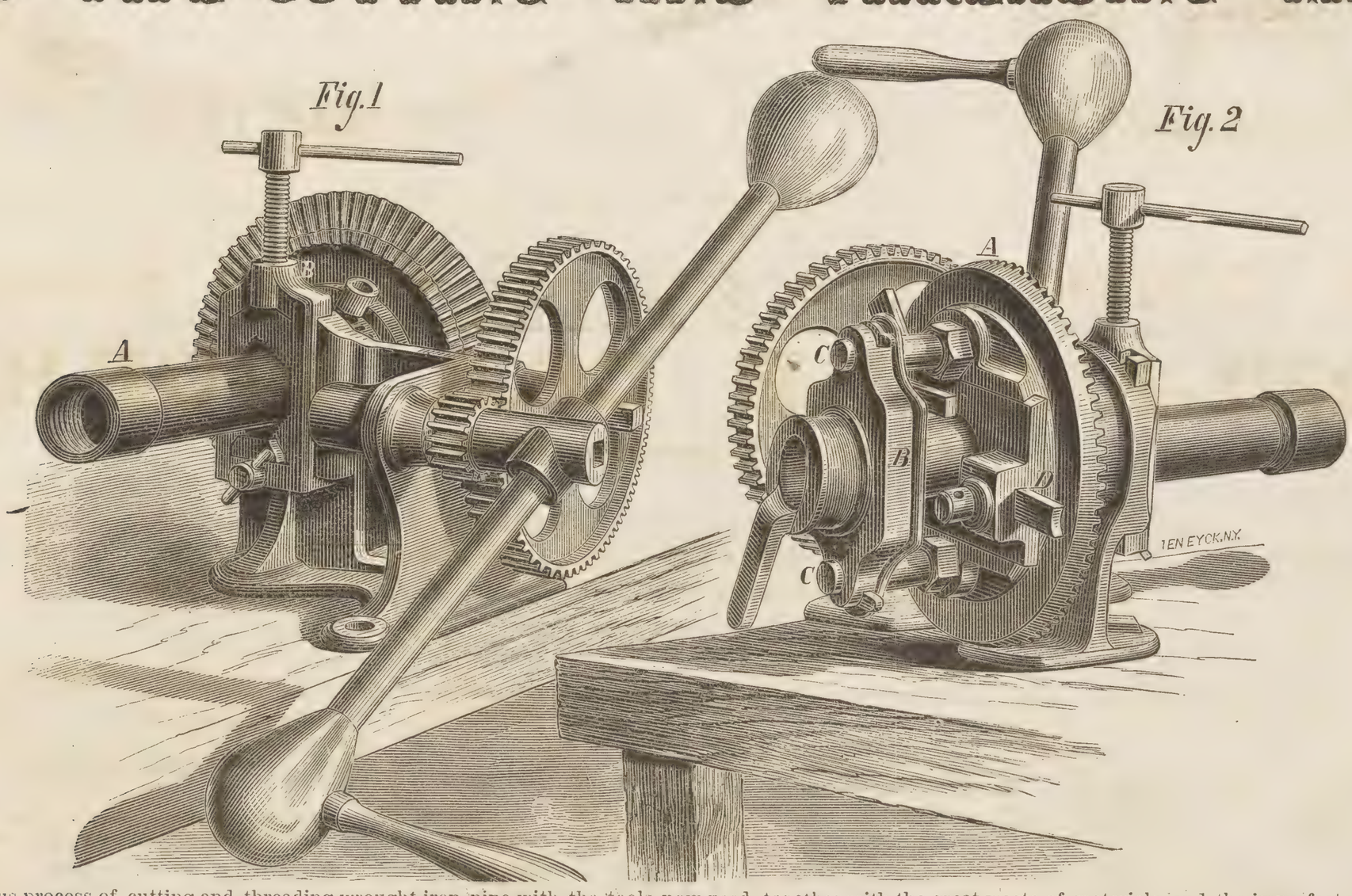
Offer for Sale

FORTY

Centre-Dumping Coal-Cars.

These cars are new and will be sold cheap for cash or on a liberal credit.

CHASE'S PIPE-CUTTING AND THREADING MACHINE.



The slow and tedious process of cutting and threading wrought-iron pipe with the tools now used, together with the great waste of materials, and the imperfect work produced, (except with expensive and cumbersome machines,) have long been causes of complaint among steam and gas fitters.

Our illustration represents a machine having the same capacity as more costly stationary machines, with the great advantage of compactness and portability, weighing but one hundred pounds, occupying a space of 15x17 inches only, and so constructed that a boy can thread, cut, or make nipples from pipe, as large as 2 inches diameter, with perfect ease.

Fig. 1 shows the machine as fitted for hand power, motion being transmitted to the several parts by means of gearing, as shown; while on the extreme left is seen the pipe, A, held stationary by the adjustable jaws of the pipe vise, B.

Fig. 2 shows the reverse of the side shown in Fig. 1. The pipe is held stationary in the vise, and passes through the centre of gear, A, the rotary motion of which is imparted to the die held in the die box, B, by means of the studs or guides, C C, upon which the die box freely slides forward as the die passes upon the pipe.

When cutting pipe, the tool post, with the cutter, D, has automatic feed, cutting ends of pipe square and smooth.

This is one of those marked successes in mechanism which the genius of invention only conceived to be perfected by scientific ingenuity and skill. It has received the approval of the Chief Engineer of the United States Navy, in a laudatory official report to Commodore Patterson. It has elicited a letter of high encomium from the Consulting Engineer of the principal gas works in the country. It has been warmly recommended by the leading machinist of the Dundee Dye and Print Works of Messrs. Reid & Barry, of Passaic, N. J., and the Chief Engineer of the Williamsburg Gas Works, and without entering into details, citing numberless instances where other machines have been abandoned for the adoption of this, it is only necessary to adduce the fact that the Pratt & Whitney Company, of Hartford, Ct., themselves manufacturers of the finest machines, voluntarily attest that they never saw a better constructed machine. The Chase Machine cuts and threads gas and other pipes from one-eighth to two inches in diameter. It will be also found invaluable in making nipples to any required length. It is operated with facility through the agency of a belt and pulley, or by manual labor, with a capacity equal to that of three men under the old method, and a great number have not only been sold in Germany, but the Company are in receipt of letters from Norway, Glasgow, London, and other European marts, touching its introduction. But perhaps the most unqualified acknowledgment of its merits is embodied in the fact of Messrs. Morris, Tasker & Co. having adopted the sale of them, and in the subjoined letter from the prominent Southern house, whose praise, rarely bestowed, materially enhances its conferment:

CHASE MANUF'G CO., NEW-YORK:

NEW-ORLEANS, January 24, 1874.

Dear Sirs:—We have your favor of 19th, and are delighted to learn of your success with your Pipe-Cutting and Threading Machine. The machine we ordered was duly received in good order, and works charmingly, giving entire satisfaction to our workmen, which we have never known any new invention formerly to have done. We have mentioned it to many parties, and presume you will get many orders from here, eventually. We shall take much pleasure in recommending your machine, which we consider the most perfect invention we have ever known.

Yours truly, A. THOMSON & CO., Sugar and Molasses Merchants and Refiners.

RAWLINS' METALLIC PAINT.

Warranted Fire and Water Proof.

Will cover more surface and outwear any paint manufactured.

Owing to its extreme fineness, every particle is utilized. No sediment settles to the bottom, and when applied, it produces a smooth, glossy surface. With less oil to the pound, this paint will go over twice the space of other so-called "Mineral" paint, and produces a more intense color. It is entirely free from dirt, slate, or any impurities, being manufactured out of the best Red Hematite Iron Ore, and pulverized finer than any paint that has heretofore been manufactured by a process peculiar to this Company.

This paint is not affected by water or extremes of cold and heat, and is peculiarly adapted for tin roofs. It will also stand hard usage, and for railroad cars or wagons can not be excelled. It has been used by the Union Pacific Railroad Company, and by whom it is pronounced superior to any quality they have ever used.

Address

Rawlins' Metallic Paint Company,

RAWLINS, WYOMING.

ALBERT C. McNAIRY, Pres't. JOHN COON, Sec. HARVEY T. CLAFLEN, Supt.
HENRY M. CLAFLEN, Vice-Pres't and Treas. SIMEON SHELDON, Engineer.

The Cleveland Bridge and Car Works,

[Established in 1851.]

THE McNAIRY & CLAFLEN MANUFACTURING COMPANY, Proprietors.

BUILDERS OF

RAILROAD AND HIGHWAY BRIDGES,

EITHER OF IRON OR WOOD.

Pneumatic and Screw-pile Sub-structures, Railroad Passenger and Freight Cars, Street Railroad Cars.

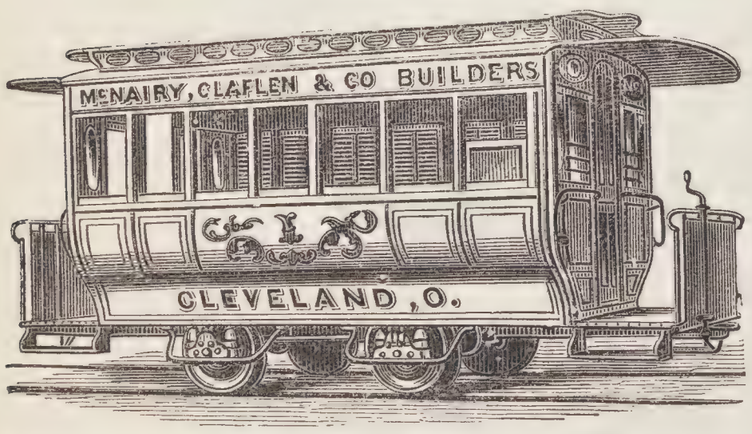
☞ Post's Patent Iron and Combination Bridges; Howe Truss Bridges, with Patent Iron Clamps; Street Railroad Cars, with Higley's Patent Running Gear and Brake.

Roofs, Turn-Tables, and Transfer-Tables

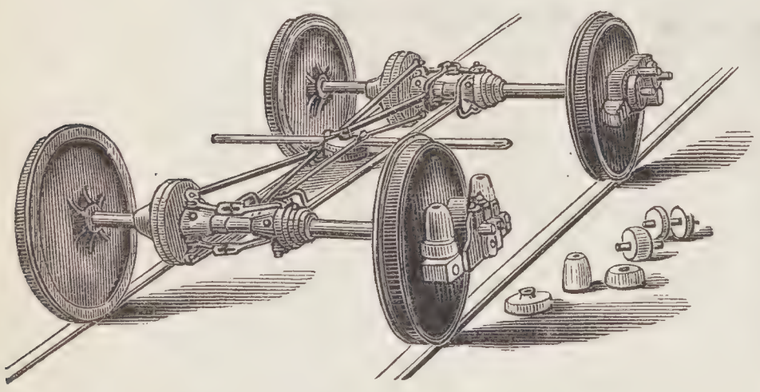
OFFICES—Waring Block, cor. Bank and St. Clair Streets.

WORKS—On Watson, Hamilton, and Lake Streets.

CLEVELAND, O.



The Lightest Running, Easiest Riding, Most Durable, and Most Economical Street Car in Use.



Higley's Patent Street Car Running-Gear and Brake.

Made and Sold by THE McNAIRY & CLAFLEN MANUFACTURING COMPANY, **Cleveland, Ohio.**

IRON CLAD PAINT.

Address IRON CLAD PAINT COMPANY,

CLEVELAND, OHIO.

This Company owns and manufactures under WM. GREEN'S several patents, and is the only Company in the world that makes Paint from pure hard Lake Superior Iron Ore, such as is used in furnaces for making Pig Iron.

The most Economical, Most Fireproof, Most Waterproof, Most Durable, and Most Useful Paint made.

Used by L. S. & M. S. RY.	I. & ST. L. R. R.
D. & M. RY. O. & M. RY.	C. C. C. & I. RY.
The K. P. R. R. CO.	L C. & L. R. R.
T. W. & W. RY.	L. S. & T. V. R. R.

Etc., etc.

OFFICE OF PURCHASING AGENT
LAKE SHORE AND MICH. SOUTHERN RAILWAY,
CLEVELAND, O., Sept. 12, 1873.

IRON CLAD PAINT COMPANY, CLEVELAND, OHIO:

GENTLEMEN: Your "Metallic Paints" known as "*Iron Clad Paints*" have, in the past six years, been extensively used and thoroughly tested by this Company, as to their *covering capacity, durability, and resistance to atmospheric changes*—latter "paint destroyer"—the most difficult to overcome in outside paints. We can emphatically accord them the highest position over any paint heretofore produced, for Cars, Roofs, Stations, Bridges, etc. The monthly increase of our orders is the best evidence that the Paint is constantly growing in favor with our mechanics.

Very respectfully yours,
A. C. ARMSTRONG,
Gen'l Purchasing Agent L. S. & M. S. R. R.

Brinckerhoff, Turner & Co.,

Manufacturers and Dealers in

COTTON DUCK,

For Car Covering and Car Seats,

14 to 150 inches wide. Also Agents

UNITED STATES BUNTING COMPANY.

A full supply, all Widths and Colors, always in Stock.

109 Duane Street, New-York.

E. A. BRINCKERHOFF, SPENCER TURNER, THEODORE POLHEMUS, H. D. POLHEMUS, Special.

ATLAS WORKS,

28th Street, Pittsburgh, Pa.

Make a ***Specialty of Freight Car Forgings*** and ***Castings*** delivered to Shops. Also ***Locomotive Cylinders, Frogs and Switches.*** Address,

THOS. N. MILLER, President.

THE BUFFALO CAR COMPANY,

BUFFALO, N. Y.,

ARE NOW PREPARED TO RECEIVE ORDERS FOR ALL KINDS OF

FREIGHT CARS.

These works, recently completed, are furnished with the very latest and best Machinery, and are prepared to furnish the better qualities of work with promptness.

J. N MILEHAM, *Superintendent.* G. STEDMAN WILLIAMS, *Secretary.*

RICHARD DUDGEON,

No. 24 Columbia Street, New-York,

Maker and Patentee of

Hydraulic Jacks and Punches,

BOILER TUBE EXPANDERS,

AND DIRECT-ACTING STEAM HAMMERS.

Communications by letter will receive prompt attention.

Jacks for pressing on Car-Wheels or Crank Pins made to order.

WALL'S MAGIC RENOVATOR.

For Cleaning and Polishing Gold, Silver, Nickel, Brass, Copper, and Lacquer Gilt on Metals. A chemical liquid free from acids, which will remove all tarnish, dirt, and grease, from whatever cause, almost instantaneously, and without injury to the metal.

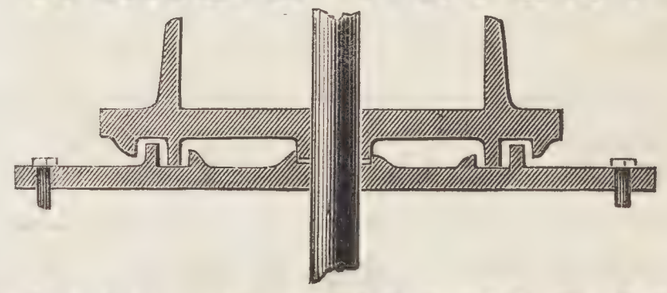
Price, per gallon, $5; in pint bottles, $1; ½ pint, 50 cents. Discount of five per cent on orders for ten gallons. A liberal commission to Agents.

Samples sent on application to

JAMES J. WALL,

P. O. Box 45 Tremont, Westchester Co., N. Y.

WARD'S PATENT



CENTER OR TRANSOM PLATE

FOR RAILWAY CARS,

With Oil Receptacle for Bearing-Ring to work in. They are acknowledged to be the best in use. See description and drawings in CAR-BUILDER for January, 1874.

Address, AMBROSE WARD,
ALTOONA, PA.

ST. CHARLES CAR CO.

This Company is now prepared to furnish on short notice, and at low prices, all kinds of

FREIGHT CARS,

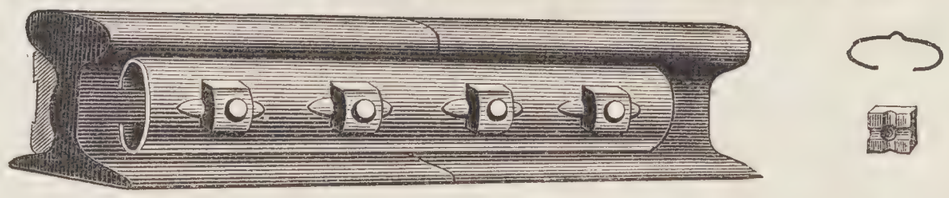
built in the most approved manner and of the best material. Orders respectfully solicited. Address,

ST. CHARLES MFG. CO.,
ST. CHARLES, MO.

REFERENCES.

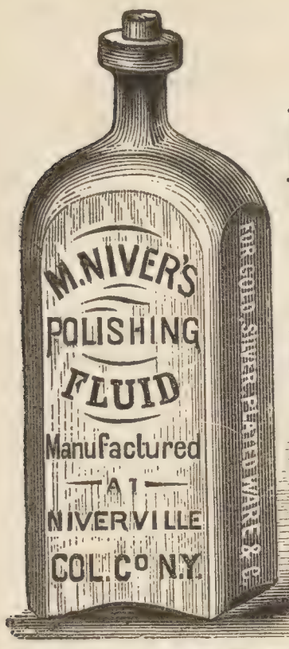
THOS. ALLEN, Pres't St. Louis, Iron Mountain & Southern R.R.
T. McKISSOCK, Gen'l Sup't St. Louis, Iron Mountain & S. R.R.
A. W. LOPER, Ass't Sup't St. Louis, Iron Mountain & S. R.R.
WM. HOGE, Pres't St. Louis, Kansas City & Northern R.R.
W. C. VAN HORN, Gen'l Sup't St. Louis, Kansas City & N. R.R.
J. L. HINKLEY, Ass't Sup't St. Louis, Kansas City & N. R.R.

THE GIANT SPRING FISH-PLATE JOINT.



A Combined Nut-Lock and Fish-Plate. The Nuts are securely held in place by a Steel Plate or Rib, and protected from jar and vibration. Costs no more than ordinary wrought-iron plates.

VOSE, DINSMORE & CO.,
32 Warren St., New-York.



Manufactured by the

Niver Polishing Fluid COMPANY,

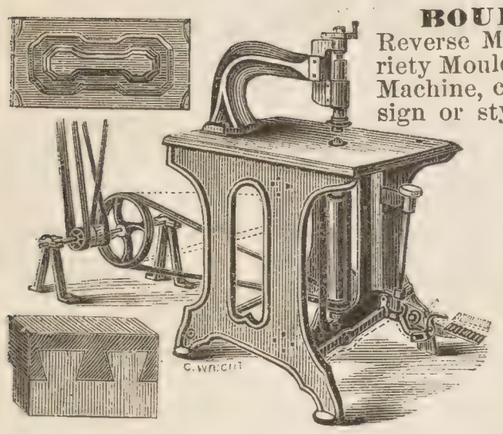
AT

Niverville Columbia Co., N. Y.

VOSE, DINSMORE & CO.

AGENTS,

32 Warren St., N. Y.



BOULT'S PATENT Reverse Motion, Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch.

Routes and grooves for Windows, Stairs, Cars, Bridges, etc., etc.

Moulds, fine Bracket and general Scroll Work. It is a first-class Shaper and Moulder, Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.

J. F. SULLIVAN,

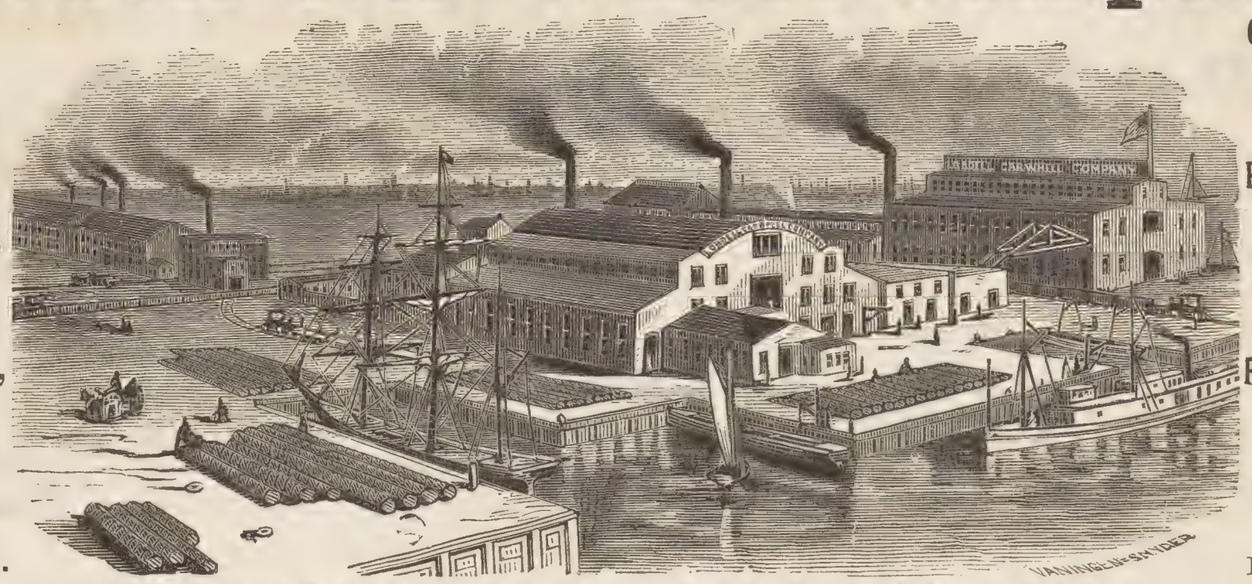
DESIGNER AND

ENGRAVER ON WOOD

No 23 JOHN ST. NEW YORK

Lobdell Car-Wheel Company.

SINGLE AND DOUBLE PLATE AND HOLLOW SPOKE WHEELS, FOR City and STEAM ROADS.



CHILLED ROLLS FOR PAPER, BRASS, COPPER, AND ROLLING MILLS.

Castings of all Descriptions.

WILMINGTON, DELAWARE.

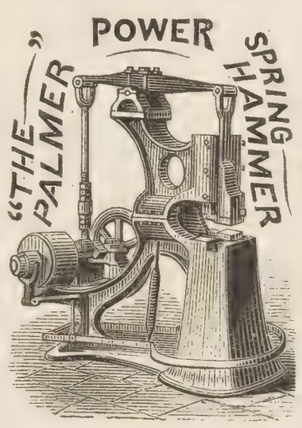
GEO. G. LOBDELL, PRES'T. W. W. LOBDELL, SEC'Y. P. N. BRENNAN, TREAS.

THIS HAMMER

Awarded the First Premium of a Silver Medal

AT THE

American Institute Fair, N. Y. City, Nov., 1873.



Superior in every point to any modification of the Trip Hammer.

Simple, Powerful,

Efficient and Cheap.

Four Sizes now being Built.

For Prices and Descriptive Circulars, address the Manufacturers,

S. C. FORSAITH & CO.,

Manchester, N. H.,

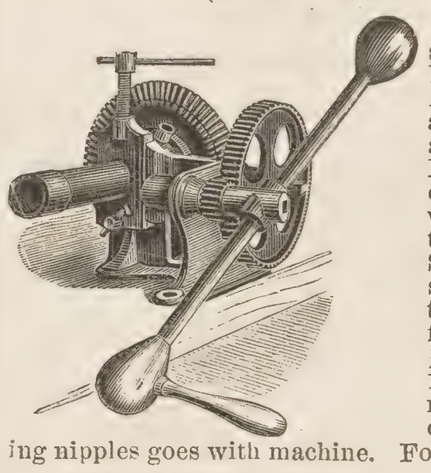
Who are also Builders of the

Abbe Bolt-Heading Machine.

CHASE'S

Pipe-Cutting and Threading Machine.

(W. D. CHASE'S PATENT.)



This important tool is designed to fill a want long felt by STEAM AND GAS FITTERS AND MACHINISTS for cutting and threading pipes rapidly and cheaply. An Apprentice Boy, with one of these, can do more work than Two Men with old appliances under the old system. No PIPE SPLITTING! No BEVEL INSIDE OR OUT! It cuts threads and makes nipples for all sizes of pipes, from ⅛ to 2 inches. Weighs only 100 lbs. Stronger than any machine made. A full set of collars and lengths for making nipples goes with machine. For Sale by

MORRIS, TASKER & CO., Philadelphia, New-York, and Boston.

Address.

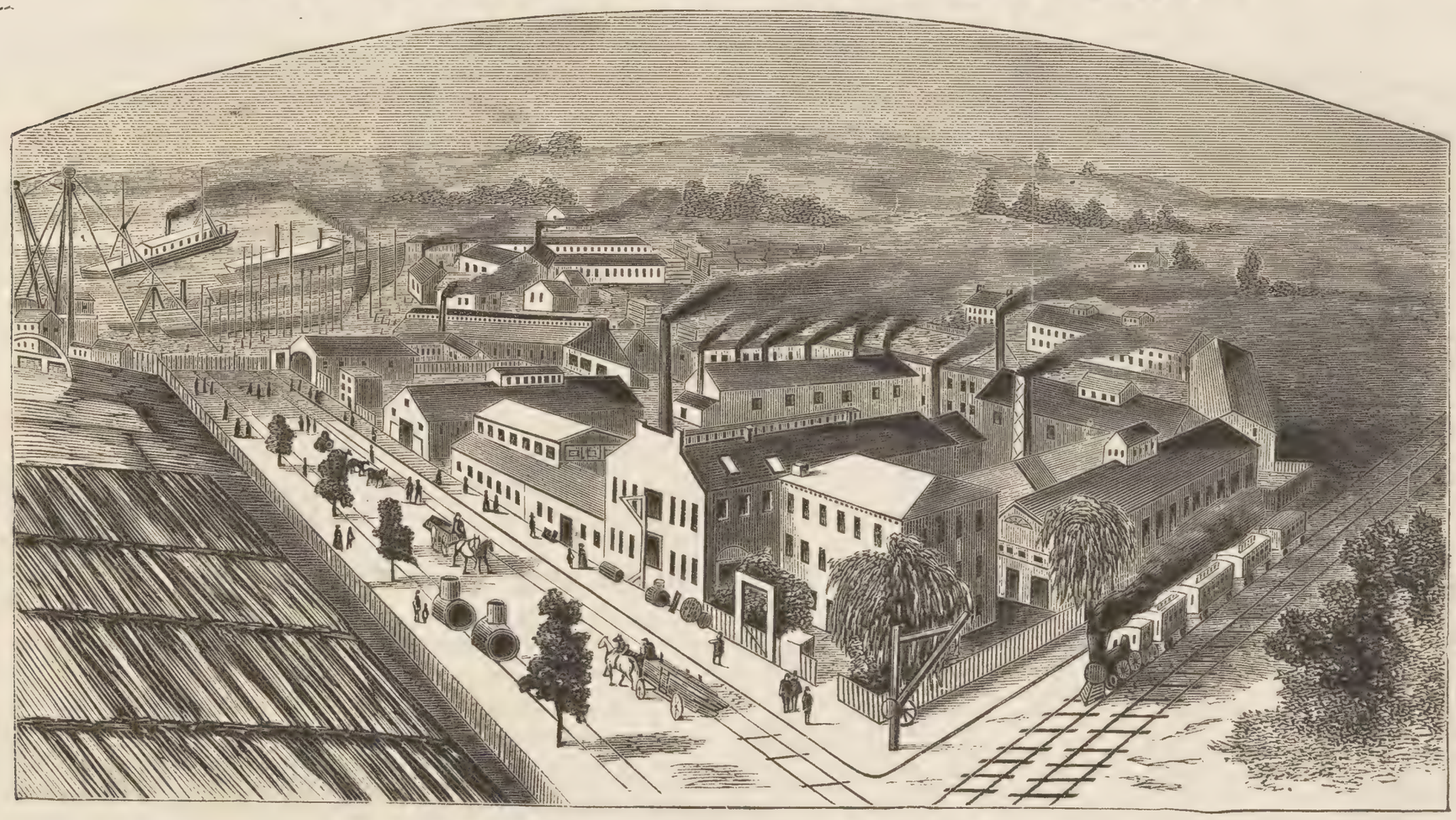
The Chase Manufacturing Co.,

120 Front St., New-York.

Send for Circular.

THE HARLAN & HOLLINGSWORTH CO.,

WILMINGTON, DELAWARE,



BUILD ALL KINDS OF

RAILROAD CARS:

FIRST and SECOND-CLASS DRAWING-ROOM, SLEEPING, BAGGAGE, MAIL, and EXPRESS, BOX, and FLAT.

WM. H. MURPHY. JAS. G. BARNET. FRANKLIN MURPHY.

MURPHY & CO.,

Varnish Makers.

SPECIAL ATTENTION PAID TO

RAILWAY REQUIREMENTS.

Outside Finishing, ...	$5.50	Engine, ...	$5.00
Outside Rubbing, ...	4.50	Coach-makers' Japan, . . .	2.00
Inside Car, ...	4.50	Black Japan, ...	1.50

These goods are now in use on the principal Railways of the country, and have had a success never before reached by any others. For Railway uses they are **Superior** to the imported.

PRINCIPAL WORKS:

238 McWhorter Street,

NEWARK, N. J.

MURPHY & CO.,
119 Larrabee St., Chicago.

MURPHY, SHERWIN & CO.,
126 Superior St., Cleveland.

THE PULSOMETER,

APPLICATION TO RAILROAD WATER-STATIONS.

The above cut represents the Pulsometer in position, supplying a locomotive tender from an adjacent stream by the use of the steam from the locomotive itself. They are fitted with flexible steam connection and adjustable delivery pipes, always ready for instant use, thus doing entirely away with the expense of water tanks, pumping engines, and local engineers at watering stations on railroads. Adapted to take water from any creek, river, or well within reasonable distance and perpendicular depth from the track. Also for filling tanks at stations it will operate with great economy and certainty, and will do away with the use of piston pumps, and all the vexations due to steam-pump engineering. Simple, durable, and reliable. Railroads equipped with water-stations complete, and warranted to give satisfaction. Send for circular.

C. HENRY HALL & CO.,

Office and Salesroom, 20 Cortlandt Street, New-York.

BRANCH DEPOTS.

11 Pemberton Square, Boston.
1327 Market Street, Philadelphia.
59 Wells Street, Chicago.
South-Western Exposition, New-Orleans.
811 and 813 North Second Street, St. Louis.

F. E. CANDA & CO.,

RAILROAD CONTRACTORS,

Builders of Cars, Bridges, Turntables, Water Stations, etc., etc.

MANUFACTURERS OF AND AGENTS FOR THE

DISNEY CAR COUPLER,

Patented June 24th, 1873.

Now in use on three Railroads in California and Nevada; also on the Cairo and St. Louis and Chicago, Danville and Vincennes Railroad.

Bumpres will be made of Malleable or Cast Iron, *except* PIN, which is made of PITTSBURGH CAST-STEEL. These couplers *will be guaranteed for one year* against breakage from defects in construction. They are coming into general favor in the West, and wherever used give entire satisfaction.

Fig. 1.

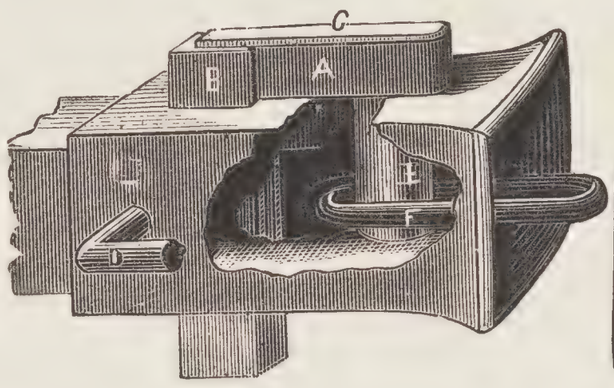


Fig. 2.

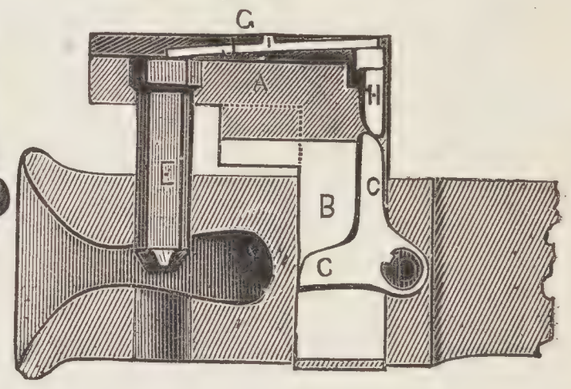


Fig. 1 is a perspective view with a portion broken away, showing the interior. *Fig.* 2 represents a section. *B* is a slotted bar which moves vertically up and down in the rear part of the bumper. *A*, the upper part of this bar, extends forward at right angles with the vertical portion, and serves as the pin-holder. *C* is an arm keyed to the horizontal shaft *D*, which passes through the bumper in the rear of the bar *B*, as shown. This arm is forked so that its branches stand at nearly right angles in the form of a bell-crank. The upper portion serves to sustain the bar *B*, and the pin where it is raised for the admission of the link. *H* represents a small, loose pin, in the bar *A* and *B*, immediately over the arm *C*. *J* represents a lever resting on the heads of the pins *H* and *E*. *I* represents the fulcrum of lever *J*. *G* is a sliding cap to cover all this interior machinery, and at the same time it forms a bearing for the fulcrum *I*. The link passing under the point of the pin *E*, raises the end of the lever *J*, which pressing on the pin *H*, displaces the bell-crank *C*, causing the bar *A* and *B* to drop, carrying the pin *E* down through the link *F*, as represented in *Fig.* 1. Then the bell-crank *C C* forms a lock that perfectly secures the link from uncoupling, until the lever *D*, as represented in *Fig.* 1, is raised.

For further particulars and descriptive circulars, address

F. E. CANDA & CO., 79 Clark Street, Chicago,

Or to

H. C. KIBBE, 419 California St., San Francisco, Cal.

THE

Atlantic White Lead

AND

LINSEED OIL COMPANY,

Manufacturers of

WHITE LEAD,

DRY AND IN OIL.

RED LEAD AND LITHARGE,

CRUSHERS OF LINSEED OIL.

ATLANTIC WHITE LEAD. PURE. WARRANTED. ROBERT COLGATE & CO.

TRADE-MARK.

Robert Colgate & Co.,

287 Pearl St.,

NEW-YORK.

KATAHDIN CHARCOAL PIG IRON.

O. W. DAVIS, Jr., Manufacturer, BANGOR, MAINE.

SOUTH BOSTON IRON CO.'S TESTS OF KATAHDIN PIG IRON, 1874:

		Density.	Tensile strength per square inch.
No. 2	Pig Iron,	7,2002	18,894
" 3	"	7,2432	26,928
" 4	"	7,2305	30,765

Nos. 1 and 2 are soft and strong, suitable for machinery and fine castings, boiler plates and steel. Nos. 3 and 4 are close-grained and tough, adapted for steam cylinders, radiators, locomotive castings, car-wheels, hydraulic presses, etc. All grades contain less than one-tenth of one per cent of sulphur or phosphorus. Shipped by rail or water from Bang or to any partof the country.

THE NATIONAL CAR BUILDER.

DEVOTED TO THE INTERESTS OF RAILWAY ROLLING STOCK.

Vol. V.
No. 12.

DECEMBER, 1874.

One Dollar per Annum.
Single Copies, 10 Cents.

The Proper Rate of Car-Hire.

We copy from the *Journal of the Railway Association of America*, the following article, on the subject of "Car-Hire," contributed by H. S. Haines, General Superintendent of the Atlantic and Gulf Railroad, Savannah, Ga.:

In August last, a committee of the Railway Association of America, appointed to report a plan for regulating the interchange of cars and rates of car-hire, issued a circular asking for information on certain points. One of the questions (No. 3) was: "If you are not satisfied with the present system, what changes can you suggest?"

In considering this question, I have been led into an attempt to estimate the actual cost to our railroad company where its cars are in use upon another road, with the view to arrive at an equitable method of charging for their use.

Three things should be considered in making a charge for car-service:

1st. The interest on the investment.

2d. The wear of running parts.

3d. The necessity for a penalty in the way of demurrage for unnecessary detention of cars.

I value a box-car in good order at $860, and consider that it will be entirely renewed in ten years, excluding, for the present, the cost of wheels, axles, and brasses. I estimate the mileage of wheels and axles at 60,000 miles, and from actual experience, I have ascertained that on this road, with 325 cars in service for fourteen months, and a mileage of nearly 9,000,000 miles, the average wear of brasses in that time was 350 miles to one pound of brass.

From the first cost of a box-car ($860) should be deducted the cost of wheels, axles, and brasses, as allowance is otherwise made for these items, and also the value, as scrap, of the castings, wrought-iron work, and bolts in the car.

Therefore, deduct from value of box-car		$860 00
4 pair wheels, at $62 per pair	$252 00	
8 brasses, 56 lbs., at 30 cts. per lb	16 80	
1455 lbs. wrought scrap and bolts, at 2 cts. per lb.	29 10	
1401 lbs. castings scrap, at 1¼ cts. per lb	17 51	
		315 41
		$544 59

Now, if the car is renewed in ten years, the annual charge for this item would be $54.46, or say 20 cts. per day, allowing 313 working days to the year.

Cost of 4 pair wheels on axles, $63 per pair		$252 00
Less value of old wheels and axles		80 00
		$172 00

divided by mileage of 60,000 miles, gives say .003 per mile run for this item of expense.

Cost of brasses, 1 lb. to 350 miles run, say	.001	per mile.
Add for wear of wheels and axles	.003	"
Total, for wear of wheels, axles, and brasses	.004	"

In 1872, on the Atlantic and Gulf R. R., the average day's work for a box-car, including loading and unloading, was 64 miles; but if we put it at 50 miles, the wear of wheels, axles, and brasses, per day, may be put at 50×.004, or.....25.6 cts. per day
Add cost of renewing body and truck frames.....20.0 "

Total cost, per day.....45.6

The above estimate is based upon the prices and usages current in this vicinity, and if correct, then a charge of 50 cts. per day should be ample remuneration to a railroad company for the legitimate use of its cars in a through freight-line, of which it is a member; and I think that this method of charging is preferable to that of mileage charge, for two reasons: the one, because it is easier to arrive at the time which elapses between the departure of a car from any point, and its return, than it is to ascertain how far the car has traveled in that time; the other, because the fact that delay to a car is a matter which more seriously affects the interests of the company to whom the car belongs, than would the fact that it had been carried ten or fifteen miles further than as reported.

This plan of charging for car-service might be applied by charging each road at the rate of 50 cts. per day for the time each car was kept upon the road, and making an additional charge of $1 per day for demurrage on unnecessary detention of cars. The fact of unnecessary detention might be fixed in the following way: allow one day for each 50 miles of road that the car passed over, as being a necessary delay, and then charge $1.50 per day for every additional day.

For instance, suppose that upon a given road, a car passed over a distance of 50 miles from a junction to a terminus, and had to return by the same route, and that four days elapsed between the arrival and departure of the car at the junction, then the allowance for necessary delay would be two days, at 50 cts. each, besides a demurrage charge of $1.50 for the two days' unnecessary delay. When a car was delayed through inherent defect, or other good cause, a rebate on the demurrage could be allowed by establishing the claim before the Executive Committee of the through freight-line.

I will add to this statement some facts as to our experience of over three years in the "Green Line." In that time, our cars on that line have averaged 62.1 miles per day (excluding Sundays), for which we are allowed 1½ cts. per mile, or 93 cts. per day. Our compensation, after deducting charges made against us for car repairs, has averaged $222.72 per car, per year, which for ten years would be $2227.20 for each car. Upon a basis of 50 cts. per day, and allowing 50 miles as a day's work, the net compensation per car, per year, would have been $129.72 per car, or for ten years, $1297.20, even though no extra charge had been made for demurrage. Indeed, it is worthy of consideration, whether the extra charge for demurrage (being in the nature of a penalty, and not as compensation for the use of cars) should not be placed to the credit of the whole line, rather than to that of the company owning the car.

It seems to me that this system of car-rent would be as easy of application as is that based on actual mileage, with the advantage, too, of fixing with more certainty the charge for unnecessary detention.

The transfer agents at each junction could make a daily report to the general office of the numbers of the cars delivered and received, and on these reports the charge for rent would be made; while, at present, it is difficult to know how many miles a car does run in the local business of the road, before passing a point at which the reports are kept.

I will add that I have had frequent occasion to object to the manner in which charges are made against us for car-repairs—that is to say, when charges are made otherwise than for wheels, axles, or brasses. The repairs may have been caused by inherent defects or by carelessness, or by an accident on the road where the repairs were made. In either case, as it seems to me, our company is always charged with the cost of repairs, save where the damage is so serious that the charge would not pass unnoticed. This objection could be removed by invariably reporting to the general office the number of any car requiring general repairs, whereupon it should be immediately ordered back to the road where it belonged. Then no charge should be allowed for repairs to other than the running parts of a car, unless accompanied by a specific statement of the character of the repairs.

My experience in through freight-lines has been confined to the "Green Line" alone, and may not, therefore, be generally applicable, but the facts, as given, are strictly correct, as relating to that line, and to the prices and usages current in this State (Georgia).

Locomotive Driving-Wheel Brakes.

We copy the following from the report of the Committee on Brakes made at the last annual meeting of the Master-Mechanics' Association:

"But little information has been elicited on the subject of driving-wheel brakes, comparatively few of them having been used up to the present time. With but one or two exceptions, those who have had experience with such brakes speak favorably of them. Brakes upon the driving-wheels of passenger locomotives would doubtless give good results, and the time may not be far distant when such brakes will be applied to all locomotives hauling fast trains, for the reason that a retarding force equal to the propelling power of the locomotive can be utilized in that manner to bring the train to a stop, and there is no reason why a retarding force applied to the tires of the driving-wheels should be more injurious in its effects on a locomotive than an equal propelling force applied

to them from the cylinders, and we think that it will be less.

"It will be shown in practice, we think, that good brakes applied to the driving-wheels of the locomotive will very materially add to the efficiency of a train-brake in making quick stops, being in effect the same as reversing the steam, but without the injurious effect on the machinery of the locomotive that results from reversing while running. A train equipped with good brakes applied to all the wheels, except perhaps the engine truck-wheels, can be brought to a stop in the shortest possible distance run, after the brake is applied, because to each wheel of the train is applied a retarding force about equal to that of the adhesion of the wheels on the rails; and when that point is reached, nothing more in the way of a retarding force can be obtained from the use of a brake applied to the wheels. In making the ordinary stops of a train, the driving-wheel brake will be found to be advantageous, at least so far as a proper distribution of the retarding force applied to the train is concerned, as it gives to each wheel in contact with the rails its proportion of the retarding power necessary to bring the train to a stop. If a train equipped with a brake to the driving-wheels, in addition to the train-brake, at a speed of thirty miles per hour, is brought to a stop in a distance run of six hundred feet, it is evident that the train can not be brought to a stop within that distance when the driving-wheel brake is not used, *all other conditions being equal.* In other words, if no retarding work is done by the driving-wheels, *more must be done by the other wheels of the train in a given time* to effect the same result.

"Brakes to the driving-wheels of locomotives drawing freight-trains have not heretofore been used to any considerable extent, and where their use involves the cost and maintenance of an independent or other style of air-pump, it is not probable such brakes will be generally used, unless the brake can be applied to a part or all of the train also. There may be exceptional cases, however, where the advantages derived from the use of the brake on the driving-wheels and tender only, will compensate for the cost of the same; but further experience and investigation will be necessary before a correct conclusion can be arrived at on this point. Under all ordinary circumstances, the hand-brakes on freight-trains are sufficient in descending grades and for ordinary stops; and in order to avoid accident, the locomotive can be reversed, and in that way exert a force equivalent to a brake on the drivers. Brakes upon the driving-wheels of locomotives used for switching purposes are in use on some of the roads in the United States, and, so far as reported, give good results. It is not probable that the benefits to be derived would compensate for the cost of such brakes in a majority of cases, yet there may be others where the advantages will warrant the cost. The switching service is so varied that no rule could be suggested that would in the main be correct.

"In some instances, steam-brakes have been applied to driving-wheels of switching-engines, and it is claimed with satisfactory results. The use of steam for applying the brake power direct to the wheels is not likely to meet with favor, however, on account of the constantly varying pressure on the pistons of the brake-cylinders. The maximum pressure per inch is that of the boiler pressure, and varies with it; and it is found to be very difficult to graduate the pressure in the brake-cylinders, from the fact that, as soon as communication with the boiler is closed, condensation in the cylinders rapidly reduces the pressure, and the moment it is again opened the pressure instantly increases to that of the boiler, so that a medium can not be reached that is not constantly varying, except through the intervention of a safety or other valve, which will admit of a certain pressure and no more, the surplus steam escaping.

"Compressed air is in every respect to be preferred to steam for applying brakes to locomotives when it can be obtained at a reasonable cost. For instance, a locomotive fitted with an air-pump and reservoir for a continuous train-brake needs only a pipe connecting the driver-brake cylinders with the air-pipe from the reservoir to the train, and they receive their supply of compressed air in the same way and at the same time that air is admitted to the other brake-cylinders of the train, and in the same degree, all being controlled and graduated at the same time and alike."

An East-India Railway Sleeping-Carriage.

A RECENT number of *Engineering* contains an illustrated description of a style of railway sleeping-carriage in use on the East-Indian Railway. They are for a 5-foot 6-inch gauge, and were designed and built at the carriage and wagon-shops at the Calcutta terminus of the line. The cost of each is a little over £400, and the weight, including 7 cwt. of water in tanks, is 9 tons. The body of the carriage is 23 feet 2 inches long by 9 feet wide outside, and 7 feet 10 inches high from top of floor to under side of inner roof-board at centre. The interior is divided into compartments with a separate retiring-room to each; the retiring-rooms are at the ends of the carriage and partly over the two buffers, thus utilizing the portions that are subject to the greatest oscillation, and reserving for passengers the central part which is least liable to motion. The seats are longitudinal, and arranged to slide on rollers and legs with casters, to enable the passengers to ride with their faces, backs, or sides to the engine, as may be wished, or to form a convenient longitudinal sleeping-coach. All the cushions are fitted with springs. The upper sleeping-berths are entirely novel; the frame is made of 1¼ inch gas-pipe, and folds up knapsack fashion, and entirely out of the way when not in use. This frame is exceedingly neat, has great strength, and is about half the weight of ordinary wood ones; it is jointed into two halves longitudinally by knuckle or rule-joints; the cushion is in halves also, and is supported on canvas stretched tight across the iron frame, thus forming a perfectly easy and elastic bed somewhat resembling a ship's hammock.

The carriage accommodates only 8 sleeping-passengers, 4 to each compartment, and this is found as many as can conveniently travel together in the hot climate of India. The compartments can be rendered quite separate by closing the sliding-door in the centre, this having fastenings on either side; or when desired, the whole can be thrown open as one grand saloon. The two water-tanks, placed between the inner and outer roofs, contain 40 gallons each, and are connected by suitable piping to the wash-basins and commodes The outer roof is on the most improved plan, affording the best protection from the direct rays of the sun, and it is connected with the side sun-shades and extended down to a height of 1 foot 7 inches from the window-rails, thus becoming one huge saddle-back enveloping the roof and sides of carriage with a clear space of 7 inches for air.

The end openings of the sun-shades are filled in with wire-gauze as a protector from sparks and dust from the engine. The space between the sun-shade and side of carriage is further rendered a complete air-tunnel. This is effected by pieces of painted canvas or leather stretched over the side-door openings, secured to a bracket on the shutting-pillar on the one side, and on to the sun-shade on the other or hinge side of door, the canvas thus folding up and allowing the door to open and shut freely. The retiring-rooms being at the ends of the carriage, form also a sort of veranda or screen for passengers, not only from noise, dust, and motion, but, what is most important in India, heat. The glass frames are all balanced, and to prevent any tendency to rise or fall with the motion of the train, they are fitted with two adjusting screws with milled heads to each; the passengers can therefore secure the frame at any desired height.

The outside lower panels are of iron $\frac{1}{16}$ inch thick, this being the only material really found to stand the climate. They are put on in rebates from the outside and well screwed all round to framing, a half-round moulding covering the screw-heads. This mode of securing adds very greatly to the strength of the framing, and is a neat job. When using wood on the East-Indian Railway, wide panels were found to buckle in the rains and shrink out of the grooves in hot weather, and to split up if secured by screws; by using very narrow panels, these defects were of course lessened to some extent, but not entirely removed. In adopting iron, it was at first thought this material would conduct or radiate heat to a greater extent than timber; after a series of experiments, this was found not to be the case, and in one or two instances, from some unexplained cause, iron actually came out cooler than wood, and by properly securing in the manner above mentioned, and not having the sheets too large, the iron has been found to run with just as little noise as wood.

The whole of the timber used in the construction of the carriage is Moulmein teak; the outside painting is white with a bluish tint picked out brown. The sun-shades are green, and the inside varnished teak; the roof is neutral tint, the floor drab, and cushions green morocco.

Shrinking of Seasoned Timber.

THE various kinds of oak, and some other kinds of valuable timber, will shrink more or less every time the surface is dressed off even a small fraction of an inch. Wheelwrights, accustomed to work in oak, are well aware of this fact, and a correct appreciation of it often enables them to turn out work of a superior character, even of ordinary materials, by first blocking out the pieces roughly, then allowing the timber to season, and afterward working the various parts by degrees, as the seasoning process becomes more and more complete. White-oak spoke-timber, for example, may be allowed to remain in the rough state for half a score of years, under shelter, without becoming seasoned so thoroughly that the timber will not shrink after the spokes have been dressed out.

Carriage-wheels have often been made of the choicest quality of oak timber after every spoke had been seasoned for several years, and, to the great surprise of the wheelwright, every spoke would work in the joints before the vehicle had run three months. The defect in such instances could not be attributed to inferior timber, nor to perfunctory workmanship; but simply to this one circumstance—that the parts of the wheels were put together before the timber had ceased to shrink.

To prove that the best quality of oak will shrink, after a spoke has been dressed out, let a tenon be made on one end, and be driven immediately into a mortise; after a few days' exposure in a warm work-shop, the spoke may be withdrawn with little difficulty. The same fact will hold good in the manufacture of wood-work of any kind where oak is employed for tenons. In order to make joints that will never start, the piece on which the tenons are to be made should be dressed over several times, until the shrinkage has ceased. Then let the tenons be made. After these have shrunk, while exposed to the drying influences of a warm work-shop, the spokes, or other parts, may be driven into their respective places, with the assurance (especially if they are dipped in oil-paint previous to driving) that the timber will shrink no more.

Many kinds of farming implements, in the manufacture of which oak and ash are employed, render very unsatisfactory service, simply because the seasoned timber was not allowed to shrink before the tenons were driven into the mortises. In like manner, oak chairs, and other oak furniture, will frequently shrink to such an extent that the pommels, rungs, dowel-pins and banisters will all work loose, if the precaution we have described is not observed.—*American Builder.*

Fig. 1.

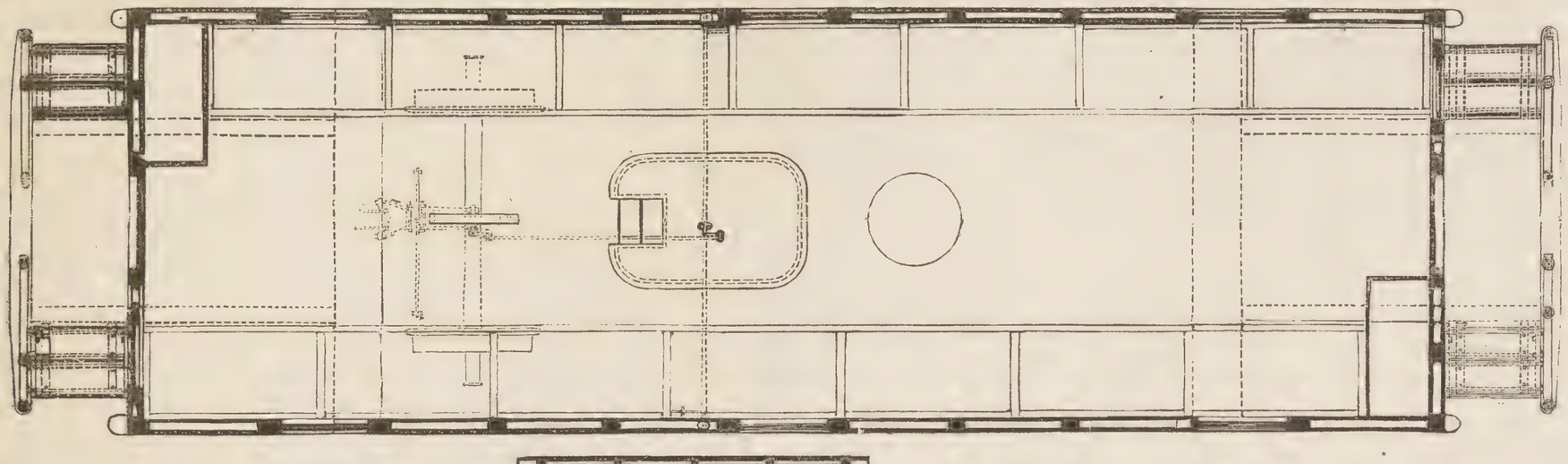


Fig. 2.

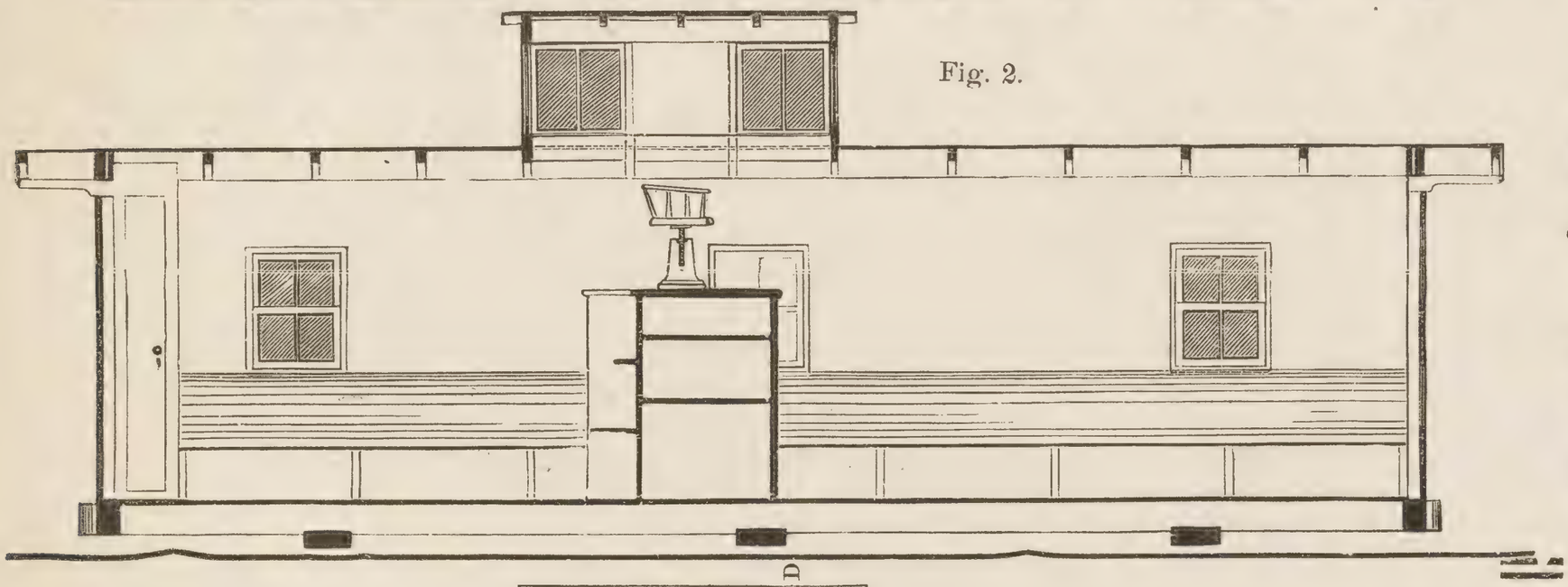
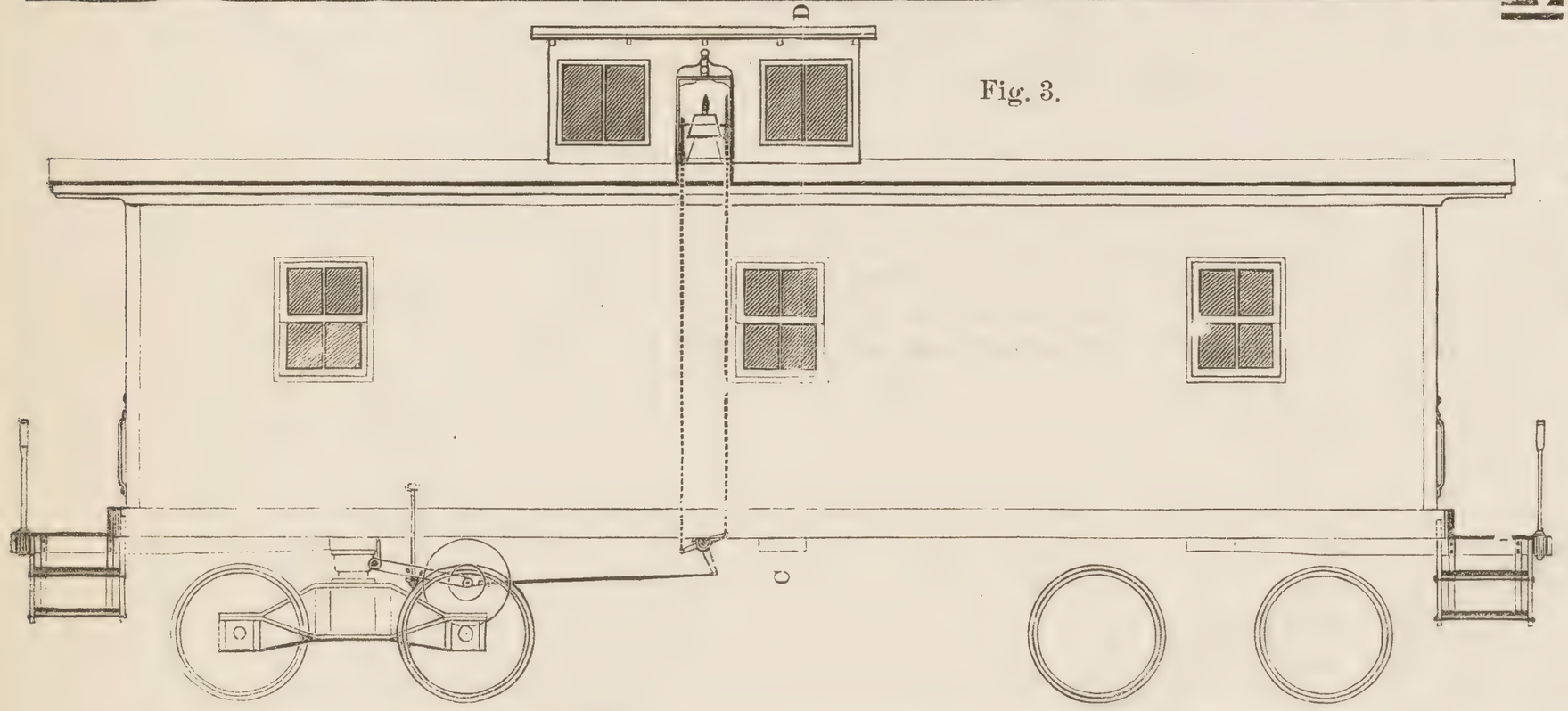


Fig. 3.



STANDARD

CABOOSE-CAR

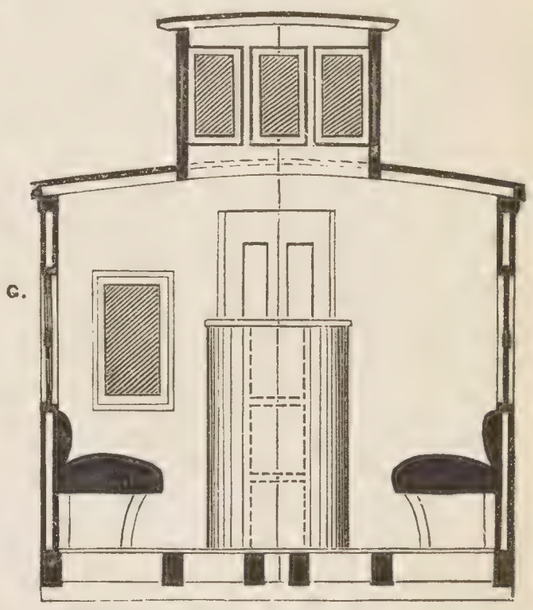
OF THE

CLEVELAND, COLUMBUS,

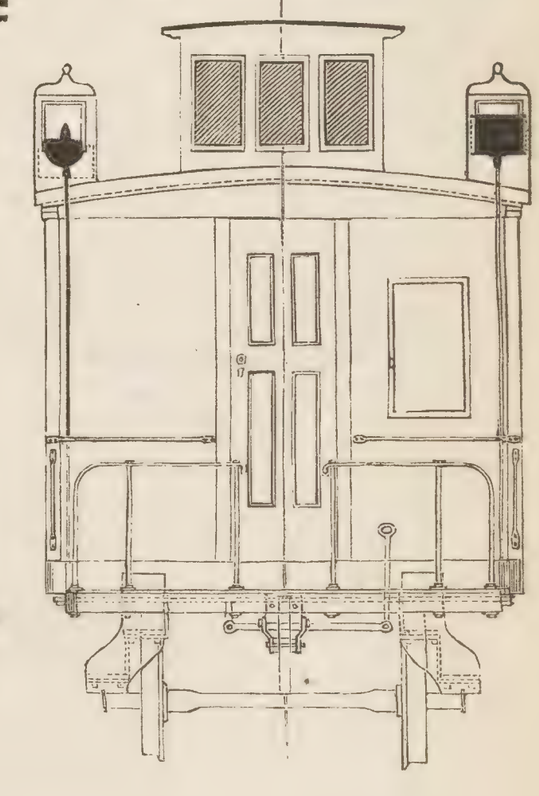
CINCINNATI,

AND

INDIANAPOLIS RAILROAD.



Section through C.D.



CABOOSE-CAR OF THE CLEVELAND, COLUMBUS, CINCINNATI, AND INDIANAPOLIS RAILROAD.

THE drawings illustrate the design and construction of the caboose-car which has been adopted as a standard by the above-named road, with Needham's Reciprocating Signal-light attached. Fig. 1 is a plan, fig. 2 is a longitudinal section through the centre, and fig. 3 a side elevation. A cross-section and end-view are represented in the detached drawings on the right. The dimensions are: length, 28 feet; width, 9 feet; height, 8 feet over all, exclusive of platforms. The interior arrangement and fitting-up are specially designed to promote the comfort of the occupants; and in this respect the car is a great improvement upon the ordinary contracted four-wheeled cabooses on our Eastern roads. In the centre, and directly under the dome, is a raised platform, on top of which is a revolving chair sufficiently elevated to enable the sitter to see in all directions through the dome-lights without exposure to the vicissitudes of the weather. At each end there is a locker, and along the sides are neatly upholstered seats. These, with the liberal space afforded by the length of the car body, make it a comfortable habitation which freight hands can not fail to appreciate. The ordinary diamond-trucks are used, and the platforms are similar to those on passenger-cars.

The leading feature of these cars, however, and one which is worthy of particular attention, is the signal-light attachment, the advantages of which will be apparent by a brief description. It is designed to secure the prompt and safe movement of trains running singly or in sections, and is worked from the axle by means of a wheel suspended from the car-bottom—as imperfectly shown in Fig. 3 and end-view—in such a manner as to be detached from the axle during the day when the signals are not used. The wheel, as it revolves, works, by means of a rock-shaft, an upright rod on each side of the car, causing a red glass at the end of the rods to move up and down before the lamps with a rapidity varying with the speed of the train, the arrangement being such that one signal shows forward and the other toward the rear. At a speed of 15 miles per hour, the white light flashes out 30 times a minute; at 10 miles an hour, 20 times a minute; and so on. It is readily seen that the working of this apparatus must correctly indicate to a following train the distance and moving speed of a train ahead, or whether it is standing still; also, in case of the parting of a train, the engineer can know how much he can safely reduce speed without danger of collision. The white light being visible at a much greater distance than a red one, is always a safe criterion for regulating speed in a fog or storm, or in running upon curves, the distance being inferred from the dimness or invisibility of the colored lights. In the end-view drawing, the red light is supposed to be on the right-hand side, and the white light on the left.

The reciprocating signal was placed upon the first car over three years ago, and its practical utility as a safeguard against collisions has been fully demonstrated. It is now attached to a large number of cars on the several divisions of the road above named, and is indorsed in the highest terms by the superintendents and others in charge. It is also in use upon other roads. It is simple in construction, easily kept in repair, can be run with as little expense as ordinary lights, and is always reliable. For more detailed information, the inventor, William L. Needham, may be addressed at 81 Hicks street, W. S., Cleveland, Ohio.

THEY are building railway-cars at Troy for the Australian market. They are sent out, it is said, at the very low rate of $8 per ton, whereas formerly as high as $40 per ton has been paid to Chili and Peru. Prospects for American enterprise in Australia are full of hope. The report of the Australian Chief Engineer, who visited the United States by direction of the government, was highly favorable, and propositions to send considerable orders for cars, engines, and bridges are under consideration.

Harmony in Colors.

THE *Cabinet Maker* has been publishing a series of exceedingly interesting articles by Christopher Dresser, on the principles of decorative design. In one of these he writes as follows in regard to certain effects and peculiarities of color, which should be understood by decorative and pictorial artists, in order to avoid discordant contrasts in work where different colors are employed :

"I have said that black, white, and gold are neutral as regards color. This is the case, although many would suppose that gold was a yellow. Gold will act as a yellow, but it is generally employed as a neutral in decorative work, and it is more of a neutral than a yellow, for both red and blue exist largely in it. The pictorial artist frames his picture with gold because it, being a neutral, does not interfere with the tints of his work. It has the further advantage of being rich and costly in appearance, and thus of giving an impression of worth where it exists.

"Black, white, and gold, being neutral, may be advantageously employed to separate colors where separation is necessary or desirable.

"Yellow and purple harmonize, but yellow is a light color and purple is dark. These colors not only harmonize, but also contrast as to depth, the one being light and the other dark. The limit of each color, wherever these are used in juxtaposition, is therefore obvious.

"It is not so with red and green, for these harmonize when of the same depth. This being the case, and red being a glowing color, if a red object is placed on a green ground, or a green object on a red ground, the "figure" and ground will appear to "swim" together, and will produce a dazzling effect. Color must assist form, and not confuse it. It will do this in the instance just named if the figure is outlined with black, white, or gold, and there will be no loss of harmony. But experience has shown that this effect can also be averted by outlining the figure with a lighter tint of its own color. Thus, if the figure is red and the ground green, an outline of lighter red (pink) may be employed.

"A blue figure on a red ground (as ultramarine on carmine), or a red figure on a blue ground, will also produce this swimming and unsatisfactory effect, but this is again obviated by an outline of black, white, or gold.

"Employing the outline thus must not be regarded as a means of merely rendering what was actually unpleasant endurable, for it does much more—it affords one of the richest means of effect. A carmine ground well covered with bold green ornament having a gold outline is, if well managed, truly gorgeous; and were the figure blue on the red ground, the lavish use of gold would render the employment of yellow unnecessary, as the yellow formed in the eye and cast upon the gold would satisfy all requirements.

"It is a curious fact that the eye will create any color of which there is a deficiency. This it will do, but the color so created is of little use to the composition unless white or gold is present; if, however, there be white or gold in the composition, the color which is absent, or is insufficiently represented, will be formed in the eye and cast upon these neutrals, and the white or the gold, as the case may be, will assume the tint of the deficient or absent color.

"While this occurs (and sometimes it occurs to a marked degree, as can be shown by experiment), it must not be supposed that a composition in which any element is wanting is as perfect as one which reveals no want. It is far otherwise; only Nature here comes to our assistance, and is content to help herself rather than endure our short-comings; but in the one case we give Nature the labor of completing the harmony; in the other, all being prepared, we receive a sense of satisfaction and repose.

"Let a blue spot be placed on a black silk necktie, and however black the silk, it will yet appear rusty. This is a fact; but we sometimes desire to employ blue on black, and wish the black to look black, and not an orange-black. How can we do this? Obviously by substituting for the black a very dark blue, as indigo. The bright blue spot induces orange (the complement of blue) in the eye. This orange, when cast upon black, causes the latter to look "rusty;" but if we place in the black an amount of blue sufficient to neutralize the orange cast upon it, the effect will be that of a jet black.

"I will conclude by repeating a statement already made, that those colors, and those particular hues of color, which improve each other to the utmost, are those which perfectly harmonize."

New Railway Refrigerating Car.

TRIAL was made recently on the Great Western Railway, Eng., of a car, the invention of Captain Acklom, for the transport of meat in a purer and colder air than in the ordinary close cars, so as to preserve the freshness of the carcasses. The car does not differ much in appearance from an ordinary railway wagon, and the patentee claims that it can be built at little more expense, and filled on occasion with any class of merchandise for which an artificially cooled temperature is not required. The body of the car consists of a double paneling of galvanized iron network, with the space between filled with two couches of inodorous absorbent felt, the outer one four layers thick, and the inner one, an inch apart from it, but a single layer. The mesh of the external panel is much larger than the corresponding mesh inside, in order to permit free ingress to the heat and atmosphere. The inner panel alone forms a ceiling to the chamber, and is covered with the felt, but with an interval of a couple of inches between its surface and the arched outer roof. The object of this arrangement is to admit the passage of a current of air when the car is in motion. Underneath is a tank from which water is driven by a forcing-pump to a covered galvanized iron gutter, running round the edge of the roof, between the panels; the outer felt is dipped in this gutter, so that the water is bound to percolate through it to a metal-lined groove below, which returns the drip to the tank. The atmosphere coming in contact with the saturated felt causes evaporation, and lowers the temperature within, while the single inner layer of dry felt preserves the meat from moisture; and it is a curious fact, the warmer the weather is, the quicker the evaporation, and consequently the cooler the interior. The carcasses are strung up on a row of double hooks inside, as in a butcher's stall, and it is stated that one car can carry those of 17½ bullocks, or eight tons of meat. The trial may be pronounced satisfactory, although the car is still susceptible of improvements, the thermometer suspended within it having registered only 62° Fah., while that of the outer atmosphere was ten degrees higher. Captain Acklom undertakes to supply provisions sound and sweet to the salesman, even in the heat of the dog-days, and to carry fish and newly-killed meat two or three days, if necessary, untainted. Poultry, milk, vegetables, and fruit can also be transported, in all their freshness, in this felt convenience. —*Scientific American.*

The Litchfield (Ill.) Car Company.

A PARTY of leading railroad men and dealers in railroad supplies recently made a flying trip from St. Louis, Mo., to Litchfield, Ill., for the purpose of inspecting the works of the Litchfield Car Manufacturing Company, and testing the qualities of two elegant new passenger-cars which had been built by the company for the Indianapolis and St. Louis Railroad. The run to Litchfield, a distance of 55 miles, was made in an hour and forty minutes. The new coaches presented a very fine appearance as models of tasteful design and good workmanship. Every portion of the wood and iron-work was manufactured at the company's shops. The excursionists were cordially received, and conducted through the various departments, in which cars in different stages of progress were being constructed. A number of narrow-gauge freight and box-cars had just been completed for the Galena and Southern Wisconsin Road, and others on an order all the way from Utah.

After inspecting the works, the party was entertained by Mr. S. D. Keeler, the local agent of the Indianapolis and St. Louis Road. A bountiful repast was served at his residence. Mr. E. R. Stiles, the president of the car company, responded to the following toast proposed by Judge B. J. Hanna, "The officers and members of the Litchfield Car Manufacturing Company." Mr. Stiles said, "In behalf of the company I represent, I thank you for your presence here to-day, and we trust that the visit will be mutually pleasant. The most of us claim to be better workers than speakers, and should we fail in expression, you can depend on our feelings and sentiments toward you being all that you could desire. Our works and productions show for themselves, and through all the struggles incident to institutions like ours, we have never lost sight of our first ideas that merit secures success; nor have we forgotten the kindness of some of you about one year ago, when confidence in business was nearly destroyed. You nobly said, 'Go on.' A confidence, gentlemen, that we expect to fully deserve. To our friends from St. Louis we say that we consider your interests and our own identical; that we, as a suburban town, must rise or fall with you. To those from other places we extend the right hand of welcome in the broadest terms of human friendship. Again I thank you, and trust you have not been seriously disappointed in the quality of our work or the reception extended."

The Litchfield Car Manufacturing Company was organized three or four years ago, has a capital of $100,000, and is officered as follows: President, E. R. Stiles; vice-president and superintendent, M. M. Martin; Secretary, W. E. Bacon; Treasurer, J. W. Davenport.

John W. Garrett.

"WRITING in the library of Congress last week," says the Washington correspondent of the Chicago *Tribune*, "I saw a portly figure at the head of a body of strangers walking up and down, and explaining things. I recognized that rubicund face, bluish-gray eye, and solid, unanxious tread and pace—the Baltimore and Ohio Railway magnate, John W. Garrett.

"He has been in Europe for more than two years. In the interim, his fellow-capitalist and friend, Johns Hopkins, has passed to the grave. During his absence, although forbidden to attend to business, Garrett wrote by every mail, and had the epitomized work sent to him. His kinsfolks—John King and Mr. Keyser—have been at the quarters of the presidency in his absence, King exercising a vice-royalty, and Keyser moving up and down the line and through the commercial centres.

"The power of this railroad is no secret. It consists in learning whatever is good from the present age, and forgetting nothing that was good in former ones. Once or twice there has been a stockholders' movement to divide more earnings, or split the stock a little thinner; but the absolutism and the old-fashioned sagacity of Garrett have prevented this going through.

"His motto has been, 'Economy in every detail, from a pound of nails up.' 'Time,' says Garrett, 'is longer than speculation. Sell nothing; restrict dividends for the sake of the long credit of the stock; all wait together, stockholders and officers; invest the surplus in the system; let politics alone; neither conciliate it nor antagonize it; particularly do not corrupt it, or you will get its appetite on edge, and it will gnaw you all your days. Responsibility in the working force; conservatism in the management; patience in the stock-list. Do not fool with localisms. Side branches must construct themselves. Push for

large terminal points, and the side places must build toward the stem we extend in their general direction.'

"Mr. Garrett took this road a short time before the war. He was a provision dealer, the son of a banker—Scotch-Irish, Presbyterian on one side, Pennsylvania German on the other. He had a hard, round head, a slow and gracious manner, a large, rolling, acute plausibility, which reminded people of a Holland burgomaster. He was never in a hurry, but always very prompt; five minutes of reflection he gave to every second of speech, except when he had a great occasion, and then he had done the thinking for weeks before. He was never deficient in confidence, but it was diplomatic and graduated, and it embraced people unctuously, instead of carrying them by storm. His pertinacity was indescribable. He returned and returned again to the same point, and by weight, and the leaning power, not attraction nor intrigue, carried the position, or persisted until it was lost. He had large Baltimore appetites for food, and his steady animal heat counteracted any intellectual relapse or melancholy, if he could be capable of it. Between work and eating, they say, his organism for a time grew unstrung. He worked on a full stomach for fifteen years around this railroad, and then a tendency to vertigo became so manifest that he had to give over and go to Europe. He told me that he had perfectly capable assistants, and should not resume his labor with so much willfulness.

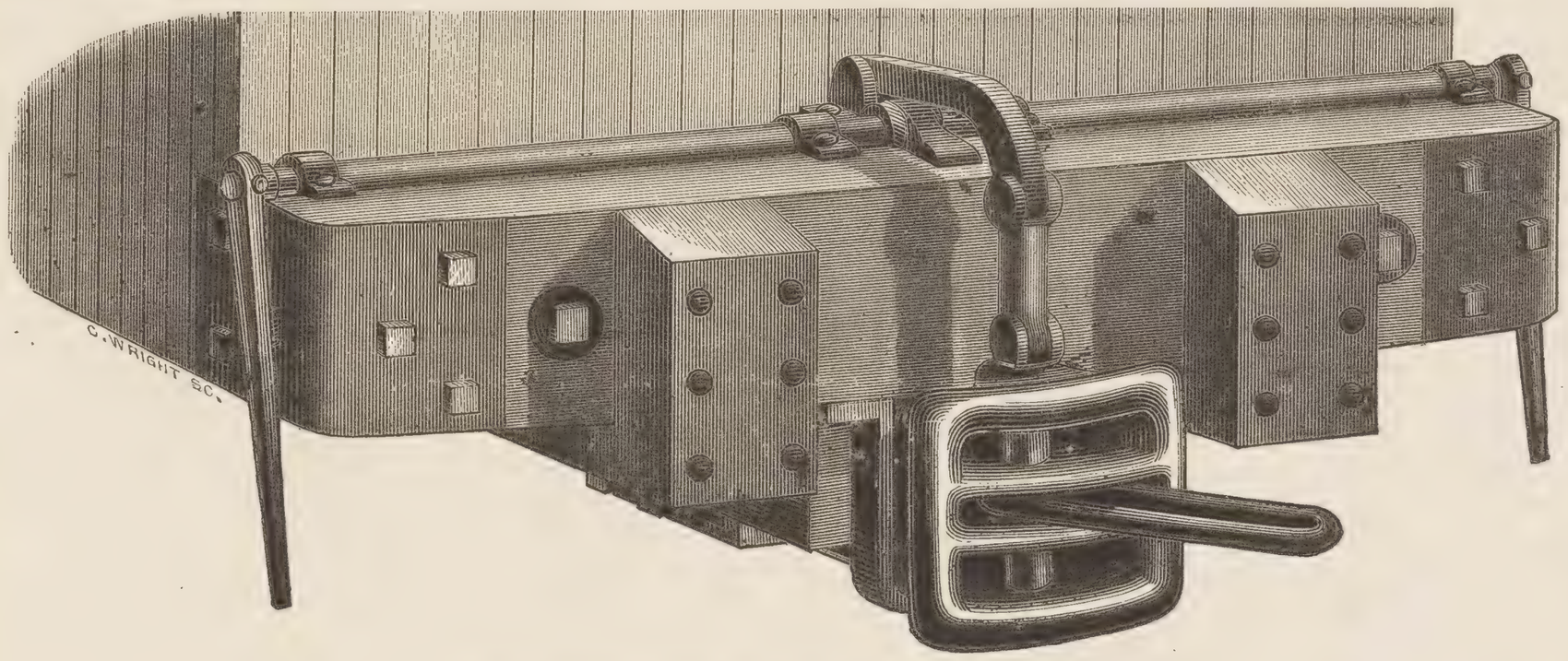
"Garrett is essentially a merchant. He has led this railroad from 35 cents on the stock up to $1.35 and more, where it stands like Mohammed's coffin, against the ceiling. From a road badly off, between Baltimore and Wheeling, it is now a road to Staunton, to Danville, to Cincinnati, to Pittsburg, to Sandusky, to Chicago. It may yet be a road to Omaha and New-Orleans. Its ambition stops at Baltimore. In that city there is an undertone of feeling that John W. Garrett may become a candidate for the Presidency of the United States."

The East River Suspension Bridge.

THE engineers of this structure have prepared plans and specifications of the massive iron saddles upon which the cables are to rest, and bids for their construction will soon be called for. The saddles, four in number, will each have for a foundation a solid plate of iron, 16 feet long, 8 feet wide, and 1½ inch thick. The plates are to be provided with two flanges, which will be imbedded in the solid masonry of the tower. But in order to provide for the contraction and expansion of the enormous mass of metal in the cables, forty-three iron rollers, 3½ inches in diameter, will be inserted in a groove between the saddles and the saddle-plates. The saddles will then be enabled to move backward and forward, and accommodate themselves to the strain of the cables, which is liable to differ in intensity according to changes of the temperature. Each saddle will weigh about 25,000 lbs., and will contain at its apex a rounded groove 19½ inches wide, through which the cable will find an exit. Each cable will be composed of more than 6,000 wires, and will sustain nearly 1,000 tons. The stay cables will bear a portion of the weight, and it is computed that the entire structure between the spans will weigh about 5,000 tons.

Boyden's Automatic Car-Coupler.

THE peculiarities of this invention are very clearly shown in the cut. The coupling-pin is attached to a lifting-arm which is worked by means of a rod extending across the platform with levers at each end, the arm having a joint-rod connection with the pin so that the latter is raised vertically from its position in the draw-head by operating the levers on the car-side. Within the draw-bar is a follower with a spring behind it and horizontal grooves in front between the division-plates of the draw-head; these grooves receive the end of the link and hold it in a horizontal position until the coupling is effected. When the pin is lifted by a forward movement of the levers, the follower slides under the pin and keeps it in an elevated position until the car to be coupled is backed up, and the link striking the follower pushes it back and allows the pin to fall. The division-plates insure the coupling in cases where the draw-heads vary in height. These couplers are manufactured by the American Railway Improvement Co., Harrisburg, Pa., and are made of wrought iron and cast steel Samples will be furnished for trial without charge. Orders may be addressed to Wm. A. Boyden, Supt., 1½ North Third Street, Harrisburg.



BOYDEN'S AUTOMATIC CAR-COUPLER.

The McBride Hydraulic Car-Brake.

THIS is emphatically a water-brake. The power is derived directly from the steam pressure against the water in the boiler, this pressure being communicated to a pipe filled with water and running from the tender underneath all the cars of the train. The water is first conveyed from the tender-tank to a three-way cock, which is placed on the locomotive, where it is always under the control of the engineer. Another pipe leads from this cock to the boiler below the water-line; a third pipe leads from the same cock and runs under the cars, the connections between the cars being provided for by means of hose couplings with self-closing valves. Under each car is a cast-iron cylinder of suitable size, with a piston, the rod of which is connected with the brake-levers. The pipe at each end of the train is furnished with an air-cock to allow the air to escape while the pipe is being filled with water. When the train is ready for starting, the air-cock is opened at the rear end of the train, and also the three-way cock to allow the water from the tender to fill the pipes.

As long as the train is running, the communication from the tender to the pipe running under the cars is kept open, thus keeping the pipes and brake-cylinders constantly full of water. The train can be stopped by a turn of the lever which operates the three-way cock and closes the communication between the tender and pipe under the cars. This cock is so constructed that the communication between the water-tank and boiler can be shut off so as to prevent the pressure from acting on the water in the tank; and also when taking off the brakes, the pressure can be shut off before opening communication again with the tank. To relieve the pressure and take off the brake, the engineer simply turns the lever back to its original position, and the brakes are instantly off, the surplus water being forced back into the water-tank by the recoil springs on the brake-levers. The train is at all times under complete control of the engineer; there can be no uncertainty of action, as is too often the case with many power-brakes now in use, for the very motive power which draws the train is the means used to stop its momentum.

In climates where the temperature falls below freezing-point, the pipes and brake cylinders are filled with a non-freezing fluid, such as glycerine and water, in such proportions as may be necessary by the temperature to which it is subjected. It is applied by means of a cylinder suspended in a horizontal position under the cab of the locomotive; in this cylinder is a floating piston or diaphragm; connected with the cylinder is a supply-tank for the purpose of keeping up the supply in the cylinders and pipes in case of adding other cars to the train, leakage, or other causes; the pressure will be exerted against the floating piston, and by this means force the non-freezing fluid against the brake pistons, and thereby put on the brakes.

The cost of the glycerine for the above purpose is comparative light, as a small quantity of it mixed with the water will prevent its freezing, and the pipes once filled do not require any more except in case of leakage or accident.

The advantages claimed for this brake are its simplicity of construction, durability, economy of working and first cost, and small tax on the time and patience of the engineer. There are no pumps to be lubricated and repacked. It will stop any number of cars in as short a distance as if there was but one car; and during its operation, the boiler-gauge does not indicate the loss of half a pound of steam. The pressure is equally exerted upon each and every car in the train at the same instant, and the measure of its power is limited only by the power of the locomotive.

We understand the brake is in successful operation on the Westchester and Philadelphia Railroad. It is also on exhibition at the Franklin Institute Fair. Circulars and illustrative drawings, with other information, may be had by applying to the McBride Hydraulic Car-Brake Company, 243 South Sixth street, Philadelphia.

THE Bellefonte (Pa.) Car Manufacturing Company is about to start up in full force on a large order for freight-cars.

THE inspection of the new third and fourth tracks of the New-York Central and Hudson River Railroad, from Albany to Rochester, has been completed, and trains are now running on them. These new track are equivalent to a double-track road 228 miles long, and are intended to be used exclusively for freight. They are generally laid by the side of the old line, but diverge in some places, especially at Syracuse, where an entirely new road has been built from East Syracuse around the city to Geddes, 7½ miles.

The Interchange of Cars.

To the Editor of the National Car-Builder:

DEAR SIR: Will you permit me, through the medium of your journal, to call the attention of master car-builders to the subject of fixing upon the valuation of cars destroyed on lines other than those to which they belong?

The interchange of all descriptions of freight-cars has become so general upon the roads throughout the country, that it is an event of no unfrequent occurrence for cars to be destroyed upon one road which are the property of another. The necessity of such interchange is unavoidable, and the practice has already grown to such magnitude that it seems to me that some uniform rule or understanding should be established and recognized, as a basis for fixing the valuation of cars so destroyed, in a way that shall be fair and equitable to all concerned. To aid in bringing this about, I would suggest the following plan:

When a car is destroyed, the first thing to be done in order to ascertain its value, is to determine the cost of a new car of the same description; for surely the original cost of the car destroyed, which may have been built during the war, or subsequently, when the prices of material and labor were much higher than they are now, is no fair criterion of its present value as a basis from which to deduct the prescribed percentage for wear and tear. Suppose, for example, a box-car has been destroyed, and we wish to get at its actual value at the time of its destruction. I would take the cost of the same style of car at the present time—say $600—allowing that a car one year old is worth as much as a new one. After the first year, I would assume an annual depreciation of ten per cent, so that in case the car I have supposed is two years old, there would be a reduction of $60, bringing its value down to $540; if three years old, a further reduction of ten per cent on the two-years valuation, bringing it down to $486; and so on according to the age of the car.

I have been induced to submit the above to the consideration of your readers, for the reason that in settling with another road for cars destroyed on the Lake Shore and Michigan Southern Railway, the value of the same was assessed upon the basis of their original cost when higher prices ruled. It seems to me that the *present* cost of replacing such cars would be a more just and equitable basis of valuation. As this is a matter in which all car-builders and railway operators are practically interested, I hope they will give the public the benefit of their views upon it, as it is quite obvious that some well-matured and uniform plan must sooner or later be adopted.

Respectfully yours,

JOHN KIRBY.

CLEVELAND, O., Nov. 1874.

Lubrication of Railway Rolling-Stock.

To the Editor of the National Car-Builder:

DEAR SIR: The elaborate article by Mr. J. M. Blanchard, on the subject of Railway Rolling-Stock Lubrication, published in your last number, contains some statements and conclusions which seem to demand a reply. It is a subject, as your correspondent says, of paramount importance; but he is quite mistaken in assuming that it has hitherto been overlooked or ignored. Intimately connected as it is with honest and judicious railroad management, every intelligent and competent manager can bear witness that it has always received a large share of attention in the operating economy of the various roads throughout the country. Experiments without number have been made with the view of reducing the cost of this special item. Such experiments not unfrequently, while seeming to abate the oil account, have on examination proved very expensive by the wear and tear and destruction of machinery, and to such an extent that many of the best and most experienced railroad managers have been forced to the conclusion that the best and purest oil is the cheapest in the long run to the consumer. The Pennsylvania earth-oils, mentioned by Mr. Blanchard, are beyond doubt the worst substitute that has ever been introduced for lubricating purposes; and the analysis he gives is unquestionably far above the average as regards their lubricating qualities. As far back as 1866, the Navy Department of the Government directed a thorough investigation to be made of various lubricants in view of the large consumption for Government purposes. The tests were made at the Brooklyn Navy Yard under the supervision of the Bureau of Steam Engineering, by the chief engineer and two of his assistant engineers. A machine was constructed especially designed to meet every requirement of a thorough test, and it is still used in testing the qualities of oils purchased by the Government.

About the same time some experiments were undertaken by direction of the Camden and Amboy Railroad Company, at their works at South-Amboy, and under the supervision of Mr. A. H. Van Cleve, the purchasing agent of the road—a machinist of ability and practical knowledge, and who had been for several years the president of the Trenton Iron-Works. The writer of this article, with several gentlemen who were interested in the subject, witnessed these experiments. They were considered very satisfactory. A special apartment had been prepared for the purpose, in which the temperature was carefully regulated, and every precaution taken to secure a fair and reliable result. These results are shown in the following tables which were published in the CAR-BUILDER three years ago in connection with a description of the experiments referred to:

TABLE No. 1.

With Locomotive Axle-Bearings, 6 inches in diameter, 7 inches long.

KIND OF OIL.	Revolutions of Shaft per min.	Pressure on Journals, lbs.	Temp. of Bearings.—Fahr.	OIL. Applied per hour—Gills.	OIL. Per cent of Lubricating value less than Flanders's Winter Sperm.	TEMPERAT'RE FAHRENHEIT. Began to thicken.	Too thick to run.	Congealed at.	Horse-power of Engine consumed by each experiment.
Winter Sperm	131	7500	96°	.73	1.00	28°	26°	24°	3.55
Winter Sperm	125	7500	98°	.68	.04	30°	28°	27°	3.39
Winter Sperm	128	7000	96°	.82	.09	32°	26°	24°	3.24
Engine-oil	130	6633	96°	.48	.12	34°	32°	30°	3.12
Engine-oil	130	6543	96°	.44	.13	19°	18°	8°	3.08
⅔ Winter Sperm, ⅓ Lard	129	5600	97°	.86	.26	...	...	...	2.61
½ Winter Sperm, ½ Lard	129	5260	97°	.84	.31	...	...	...	2.45
⅓ Winter Sperm, ⅔ Lard	132	4500	96°	.76	.40	...	...	...	2.15
Engine-oil	131	4125	97°	.82	.45	...	...	...	1.94
Mason's Sperm	127	4264	97°	.74	.45	...	...	...	1.96
Lard-oil	129	4000	98°	.69	.47	...	...	...	1.86
Engine-oil	129	3844	97°	.81	.50	...	...	...	1.77
Engine-oil	129	3500	97°	.75	.54	...	..	...	1.62
Engine-oil	125	3471	97°	.72	.56	...	...	...	1.56
Engine-oil, No. 2	125	1458	97°	.68	.81	...	...	...	0.66
Engine-oil	124	753	96°	.73	.90	...	...	...	0.34
Refined Mecca	127	266	98°	.71	.97	...	..	...	0.12

TABLE No. 2.

With Car Axle-Bearings, 2¾ inches in diameter, 6 inches long.

	Winter Sperm	251	7000	95°	.25	.00	28°	26°	24°	3.18
	Car-Box oil	237	4854	93°	.17	.35	17°	15°	10°	2.08
Mineral.	Car-Box oil	225	4684	96°	.15	.40	31°	24°	12°	1.91
Mineral.	Car-Box oil, No. 1	241	4014	96°	.16	.44	20°	18°	17°	1.75
Mineral.	Car-Box oil, No. 2	240	4171	95°	.15	.43	13°	10°	.. °	1.81
Mineral.	Car-Box oil, No. 3	245	4071	95°	.16	.43	16°	14°	13°	1.79
Mineral.	Car-Box oil, No. 4	242	2500	95°	.18	.66	28°	26°	10°	1.09
Mineral.	Car-Box oil, No. 5	243	4000	94°	.14	.45	15°	13°	10°	1.76

TABLE No. 3.

With Locomotive-Axle, at different velocities.

Winter Sperm	130	7000	97°	.40	.....	...	...	...	....
Winter Sperm	100	7200	94°	.26	....	...	...	...	....
Winter Sperm	70	8000	94°	.18	.....	...	. .	...	....
Winter Sperm	60	9800	94°	.14	.....	...	...	...	....
Winter Sperm	130	7000	98°	.36	.....	...	...	...	....
Winter Sperm	100	7500	96°	.25	.....	...	...	...	....
Winter Sperm	70	8000	91°	.19	.....	...	...	...	....
Winter Sperm	60	9500	90°	.10	.....	...	...	...	....
Engine-oil	130	6500	96°	.24	.....	...	...	...	....
Engine-oil	100	7500	96°	.18	.....	...	...	...	....
Engine-oil	70	8000	92°	.14	.....	...	...	...	...
Engine-oil	60	9500	87°	.05	.....	...	. .	...	....
Lard-oil	130	4000	98°	.31	.....	...	...	...	....
Lard-oil	100	5000	95°	.18	.....	...	...	...	....
Lard-oil	70	5500	93°	.12	.....	...	...	...	....

This would seem to be a sufficient refutation of the assumptions of your correspondent that this subject has not received the attention it deserves, and must convince any intelligent railroad machinist and engineer—who are in fact the only reliable judges—that the experiments of Mr. Van Cleve were conclusive upon the subject.

In regard to Mr. Blanchard's suggestion that a general experimenting or testing shop be established under the auspices of the various roads, I am forced to the following conclusions:

1. That the plan of a mutual oil bureau can never be carried out; or, if such a bureau is established, it would soon develop into a farce.

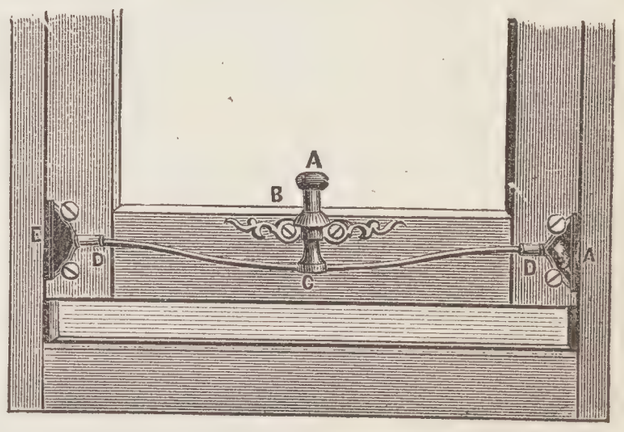
2. That the only proper judges in regard to lubricating material for railway machinery are the machinists and engineers who have charge of such machinery. The intelligent, practical car-builder is the best judge of timber; the practical coach-trimmer the best judge of trimming material; and so on with respect to each and every department.

To devolve upon a single individual or a bureau the selection of the multitudinous assortment of merchandise required by a large railway corporation, would imply the possession of almost supernatural ability, or a combination of qualities rarely found in any human subject. Chemical analysis is of course all very well—it shows the component parts of a sample of oil according to scientific method; but your plain, plodding engineer can give information far more important and more to the point, as respects economy, the preservation of machinery, and efficient service.

C. S.

Sash-Holder for Car-Windows.

THE cut illustrates a very effective device invented and patented by Mr. L. J. Baker, of Philadelphia, and specially designed for use upon car-windows. It consists of a bent steel spring, *D D*, which extends all the way across the sash. This is held by two clamps, screwed fast to the sash. Outside of these clamps and attached to the wire at each end is a bearing piece or shoe, *A* and *E*. The wire, before it is put into its position, is straight, so that it constantly has a tendency to spring to its original form. Its tension therefore presses the shoes, *A*, *E*, against the window-frame, and will thus hold the sash in any position in which it is placed. The wire spring is released by holding on to the piece *B*, and pressing down the latch *A* with the thumb. This contrivance will hold the sash down as



well as up, and locks the windows as effectively in any position as a bolt would. It has the great merit, the want of which has frequently been pointed out, of enabling the traveler to raise or lower the sash any desired distance, the facilities for doing which are so seldom furnished by car-builders. It is practical, durable, and not liable to get out of order, and can be attached without mutilation of the wood-work. Communications in regard to it may be addressed to H. Bradford & Co., 26 Merchants' Exchange, Philadelphia.

IT is reported that the receivers of the New-York and Oswego Midland Railroad are about to withdraw all the passenger-trains, except on the Utica Branch, where the local travel is considerable. On the main line all the passenger business will be carried by passenger-cars attached to the freight-trains.

More about Check-Chains.

To the Editor of the National Car-Builder:

DEAR SIR: The method of attaching check-chains to the cars of the Boston and Albany road, as described and illustrated in the October number of the CAR-BUILDER, is liable, as it seems to me, to some objections. Should the wheels upon one side of the truck, in case of derailment, get so far from the rail as to clear the ends of the ties, the car would be more likely to turn over than if the chains were attached to the side-sills. The centre attachment would allow the car to incline further without straightening the chain; while with the sill attachment the slack of the chain would be more quickly exhausted, and the resistance of one half the weight of the truck brought to bear to prevent the car from going over. If this view of the case is a correct one, we must then determine whether the advantage of a more direct line of resistance claimed for the method of attachment to the draw-head timbers, is not more than counterbalanced by the increased liability of the car to capsize in case the wheels get beyond the ties, as they often do when off the track. When the subject of check-chains was under discussion at Cincinnati, in June last, most of the cases cited where such chains had proved useful, were such as show the obvious advantage of their attachment to the sills. In case of a broken wheel or axle, however, the plan of Mr. Adams might have a special advantage. In such an event the corner of the truck would naturally droop, causing a strain that would crowd the flange of the opposite wheel hard against the rail, and so keep the truck on the track.

The application of chains to both ends of the truck is, I believe, generally approved by those who favor check-chains at all; for it is evident that if the forward wheels of a rear truck should leave the track, the result would be as disastrous with but two chains attached as if there were none. There is much diversity of opinion among car-builders as to the best method of attachment to the sills. A strap-hook with bolts is objected to by many because the strain would only be upon one bolt at a time, making them liable to be broken in detail. My attention was attracted to a plan not long since which seems to overcome this difficulty to some extent. It consists of a clevis fitting the sill on both sides and across the bottom, and fastened to it with two bolts, one of $\frac{5}{8}$ and one $\frac{3}{4}$ inch iron, the smaller one being at the top. At the bottom of the clevis was a hook to receive the chain. We think, however, it would be better to have the hook on the chain, and an eye to receive it in the clevis. This may be an old and obsolete plan with some, but it is new to the writer.

What I have said is not intended as a criticism of Mr. Adams's plan, but merely to present some points which have occurred to me respecting one of the unsettled railway problems. MACK.

MESSRS. DAWSON & BAILY, of the National Locomotive Works, at Connellsville, Pa., have been running their works with a full set of hands ever since the panic set in, which is something extraordinary when it is considered how railroading has been affected by the hard times. They have just closed a contract with the Cairo and St. Louis Narrow-Gauge Railroad Company, the filling of which will keep the works running all winter.

A COMPANY has been organized at Sedalia, Mo., with a capital of $100,000, to build and run refrigerator cars from Texas to northern and eastern points. It is called the Texas and Atlantic Refrigerator Car Company.

Improved Axle-Journal and Bearing.

THE engravings illustrate an improved journal and bearing of which Mr. John Bailie, of Milwaukee, Wis., is the inventor and patentee. The improvement consists of a journal with a symmetrical concavity around its periphery, and a bearing corresponding thereto, its wearing surface being convex longitudinally and concave in cross-section, as shown. Fig. 1 is a side-view of journal with bearing shown in section; Fig. 2 is a cross-section through centre of journal and bearing; and Fig. 3 is an end-view of bearing.

Several advantages are claimed for this method of construction, the principal of which is the avoidance of lateral motion and end-friction of the bearings or brasses, the whole weight of the car constantly operating to prevent the sliding of the brasses in either direction, thus making their wear more uniform and greatly diminishing the end-wear. The lateral thrust of the wheels against the rails is reduced to a minimum, the truck has less tendency to spread, and the wearing capacity of both wheels and axles is increased, as well as the life of the bearing. The lubrication is more perfect, the oil naturally tending to the centre of the journal and causing less waste. The journals are made without collars. A practical test of the device has been made, and after a year's service the journals showed scarcely any perceptible wear, and not a single case of heating has occurred. The cost of fitting up is no more than ordinary.

The plan is such a departure from ordinary practice that it may be regarded by some as a novelty. If it has heretofore been tried either in this country or in Europe, we have no record of the results. The inventor is an experienced railroad mechanic, who fitted up a car in this way as long ago as 1870, the results of which have been in all respects satisfactory.

FIG. 1

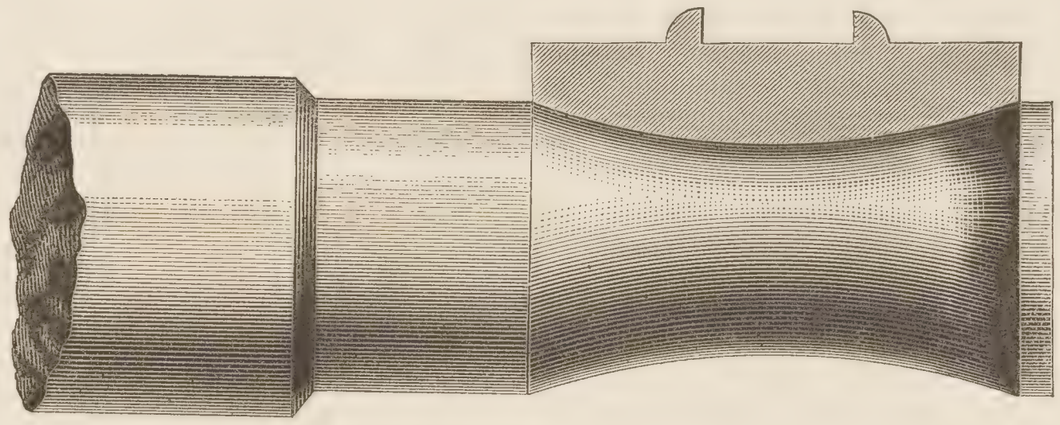
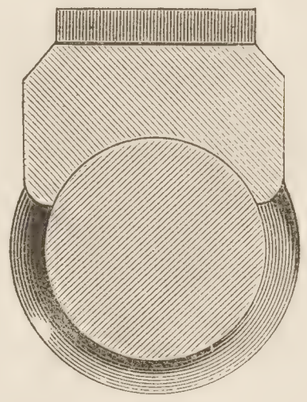
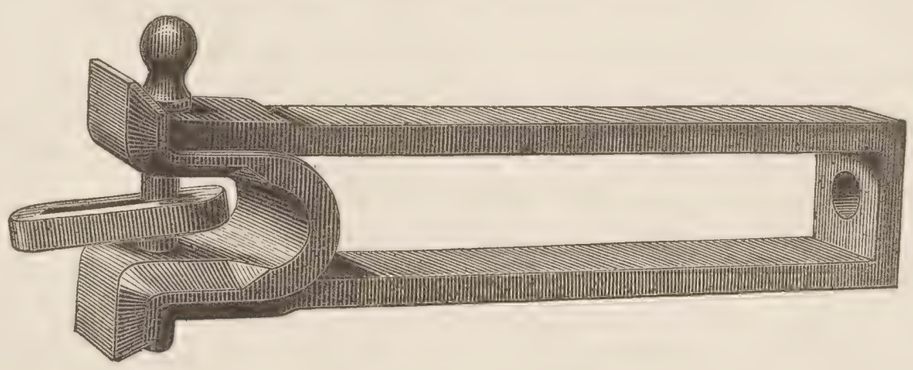


FIG. 3

FIG. 2



BAILIE'S IMPROVED JOURNAL AND BEARING.



Lowrie's Improved Draw-Bar.

THE advantages of this improvement are apparent from a glance at the engraving. The construction is such that when the draw-heads are in contact, the cars can be safely coupled by merely taking hold of the link, bringing it to its place and dropping in the pin. The space between the jaws enables the brakemen to handle the link without danger of getting their hands caught. The cars once in contact, one or two men can easily and speedily couple a whole train with no loss of time in slacking ahead and backing, as is often necessary when couplers are not rightly set. The old style of draw-bars can readily be changed to this pattern without loss of material, or can be used in connection with it. It is 30 inches in length, weighs 100 pounds, and is of course made of wrought-iron. The cost does not vary materially from that of the old style of bars, and it has been approved by practical use on the roads. Address Roberts & Co., Fort Wayne, Ind., or H. C. Lowrie, the inventor and patentee, Denver, Colorado.

MR. FAYETTE CURTIS has been appointed to take charge of the Fourth Avenue Improvement in place of I. C. Buckhout, deceased.

A MOST extraordinary day's work has been done in the rail mill of the Pennsylvania Iron Works, Danville, Montour county, Pa. There were heated, rolled, sawed, hot-piled, straightened and punched, and in all particulars made ready for use, 156 tons of rails, a feat that has never before been accomplished in the world inside of *twelve* hours, through one set of rolls, and with the usual force of men. So says the local paper.

THE Pennsylvania Railway Company owns about 16,000 eight-wheeled freight-cars, valued at $512 each; 1800 four-wheeled freight-cars, worth $170 each; 521 passenger-cars of all grades, worth $3550 each, and 879 locomotive engines, worth $11,000 each. Total valuation of the rolling-stock, twenty millions of dollars. The length of the company's tracks, or those controlled by the company, is 5934 miles.

AN invention is now on exhibition in Liverpool by which oil or glycerine is made to perform the functions of steam, by the same means—application of heat—which expands the oil placed in small cylinders, from which it is claimed a pressure of 10,000 lbs. per square inch may be obtained without the dangers of steam explosion, which prevent using a pressure of more than 200 lbs. to the square inch generally. In this case an explosion would only crack the cylinder containing the oil, it is claimed.

THE railroad companies owning the Baltimore and Potomac, the Alexandria and Washington, and the Alexandria and Fredericksburg Railroads have adopted the system of train agents, and to-day put thirty-six of such agents on some of the other roads under their control. These agents collect the fares and attend solely to the passengers, leaving the conductors to devote their entire attention to the management of the train. It is understood that the new system will be put into operation on the companies' roads at an early date.

THE Philadelphia, Wilmington and Baltimore Railroad Company are adopting an improvement by which the engineer has full view of all the cars of the train. The cab has a pipe attached extending through the roof, the opening of which is just before the engineer. In this is placed a camera, which reflects the condition of the train. Accidents due to uncoupling or parting of trains should thus be avoided.

THE Detroit Car-Works and Michigan Car Company's Works have a fair average force employed, and are full of work.

THE new Union depot at Columbus, Ohio, is nearly completed. It is a large and handsome brick structure, a most striking contrast to the dingy old shed which it is to supersede.

The National Car-Builder

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JAMES GILLET, EDITOR.

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Editorial Announcements.

CORRESPONDENCE.—*We cordially invite the co-operation of the railroad public in affording us the material for a good mechanical paper. Articles relating to rolling-stock and machinery, by those practically acquainted with those subjects, will be gratefully received. All communications must be addressed to Vose, Dinsmore & Co., No.* 32 *Warren Street.*

ADVERTISING RATES.—*For one square, or one fifth of a column,* $5 *per month, or* $50 *a year. For half a square,* $3 *per month, or* $25 *a year. Larger advertisements by special contract.*

All communications in regard to advertising should be addressed to L. F. DINSMORE, *Post-Office Box* 4055, *New-York City, who is our agent for advertising, and authorized to make contracts, collections, etc.*

ENGRAVINGS AND ILLUSTRATIONS.

We would invite the attention of Master Car-Builders and others to the advantages to be derived from publishing in THE NATIONAL CAR-BUILDER *engravings designed to illustrate the various features and details of car construction, and especially such improvements as can not otherwise be clearly presented. We will procure cuts to be made in the best manner from drawings or models that may be sent us, and charge only for the cost of engraving, inserting the same in our paper with suitable descriptive details, without charge.*

Notice to Subscribers.

THE new postal law, which takes effect on the 1st of January, requires the pre-payment of postage on all newspapers, magazines, etc., before they can be transmitted through the mails. The CAR-BUILDER, under this regulation, will be subject to a yearly postage of 10 cents, which must invariably be paid to us on payment of subscription. The subscription price for the ensuing year will therefore be $1.10, instead of one dollar, as heretofore.

The Interchange of Cars.

THE necessity of some well-matured and equitable plan for regulating the interchange of freight-cars, is becoming more imperative every day; but as yet no decided steps appear to have been taken in any quarter toward the framing of such a plan. The number of cars in the United States which daily pass from one line of road to another is very large, and this number is bound to increase in proportion as roads and traffic are extended, and a greater uniformity of gauge established. The interchange has to go on, whether there is any satisfactory system for its regulation or not, and questions are constantly arising in the regular course of business which have to be adjusted in some way, and the adjustment is not always in accordance with justice and right. There should be an elaborate and carefully devised code in which every contingency likely to arise in the complications of traffic is provided for, and such code should have the validity of law with all roads. We need not enumerate the difficulties which attend the present system, or rather no system, in the matter of settling claims for car-service, repairs, losses, etc., between different roads. They are too numerous to be even classified very readily, as every one knows who is at all familiar with the business of railway transportation. It is obvious that some reform will have to be inaugurated before a great while as a matter of sheer necessity; and if this is so, the sooner the problem is grappled with the better. There are plenty of experienced railroad men in the country fully competent to deal with it, but the work will never be done without some specially organized effort. We believe the Railway Association of America undertook to do something of the kind a year or two since, but so far as we are aware, nothing came of it.

The rules adopted by the Master Car-Builders, at St. Louis, in 1872, are well enough so far as they go, but they fall very much short of what is required. They merely indicate in a general way what should be done in certain specified cases, leaving a vast deal of ground uncovered, and having none of the force of a binding obligation such as an elaborately detailed and organized system would have when approved and formally accepted by all the leading roads. Mileage and time are the two factors which should be recognized as the basis in making settlements. The means should also be provided for fixing responsibility where it rightly belongs, for ascertaining with certainty how and where detentions occur, and for tracing and determining with accuracy the location of a car at any time after it leaves the line to which it belongs. A multitude of other things relating to repairs, usage, and unfair advantages taken by rival, unscrupulous, and needy roads, should also be provided for in any system that may be adopted. There should be penalties for wrong-doing, and the means for enforcing such penalties. It is doubtful whether any code of regulations could be devised that would perfectly meet every requirement, but one could certainly be framed that would be more satisfactory than the present state of things.

A very obvious defect in one of the rules adopted by the Master Car-Builders is referred to in a communication from Mr. John Kirby, of the Lake Shore road, in another column, in which he shows the injustice of making the actual cost of a car years ago, when prices were inflated, the basis upon which to estimate its present value under the rule. When a car is destroyed upon a foreign road, the owners are entitled to remuneration according to its actual value at the time of its destruction; and the defect in the rule is in making no discrimination in the cost of material and labor under a fluctuating standard of value, or in other words, an irredeemable, inconvertible, greenback currency.

Machinery and Invention.

THE annual Fair of the American Institute in this city, and that of the Franklin Institute in Philadelphia, have been noted during the present season for the variety and intrinsic excellence of the articles exhibited. The display of machinery has been one of the attractive features of both, and especially of the Philadelphia exhibition, where the managers and contributors appear to have been stimulated to extra exertions by the approaching centennial. The contributions are mainly from that city, and the magnitude of the display is in the highest degree creditable to its manufacturing industry and enterprise, and an indication also of the progress and extent of kindred industries throughout the land. The most interesting feature of the exhibition is the variety and improved quality of machine-tools. Among the prominent exhibitors we notice the names of Wm. Sellers & Co.; Edwin Harrington & Son; Richards, London & Kelley; W. B. Bement & Son; Ferris & Miles; C. V. Haagen & Co., and others. Our space will not permit a detailed notice of the various products of these well-known establishments, embracing both heavy and light machinery—oscillating engines, steam-hammers, rotary shapers and planers, chuck lathes, boring-machines, portable drills, rotary blowers, etc. This preliminary display, which is altogether local in its character, affords a significant foretaste of what may be looked for at the national exhibition to come off two years hence.

American inventors and inventions have already been placed in a superior attitude before the world. The almost incredible number of patents issued within the past few years has not been the result of a profitless and unproductive mania, as the very great number of worthless inventions would seem to indicate. The product comprises wheat as well as chaff. There is an accelerated progress in the way of improvements which are constantly being engrafted upon previous inventions. This is true chiefly with respect to machines adapted to the reproduction of certain forms to be used interchangeably, and tools to enable the unskilled workman, with but a modicum of native wit, to accomplish with accuracy and precision what he could not otherwise accomplish, except by a regular course of training. The export of American machinery and tools to foreign countries is constantly increasing. We need not refer to locomotive-engines, agricultural, automatic, wood-working, and milling-machines, the universal scroll chuck, and a great number of devices and tools designed to expedite and simplify mechanical processes, and at the same time relieve the tax upon the judgment and manual dexterity of the operator.

Judging from the experience of the past, it would be difficult to set a limit to the inventive activity which would follow the discovery of a new motor cheaper than steam and equally powerful. There can be little doubt that in such an event the boasted mechanical appliances of the present time would be superseded by others of a superior order, until manual labor, except in the construction and working of machinery, would go quite out of fashion. Without speculating on the results or the probabilities of such a discovery, it is evident that under the steam *régime* labor is being transferred more and more from hands of flesh to hands of iron; yet the intrusion of machinery into the field of labor causes no forced idleness, but precipitates the workers into new and neglected fields. Two centuries ago a labor-saving machine of the simplest description was regarded as a precursor of calamity and ruin; but any one who visits the industrial fairs of this present year of grace, and makes an intelligent inspection of the machinery departments, will feel no such concern. The bugbear of machine-labor, once so formidable, has lost its terrors by a closer acquaintance.

Car-Wheels.

THE report of the discussion on car-wheels which was published in our last issue, exhibits the views of manufacturers and railway mechanics upon some interesting points involved in material and construction. The views expressed, although brief and desultory, considering the nature and importance of the subject, are none the less valuable as embodying the experience of those who are most capable of throwing light upon controverted points. The subject, we are informed, will be again taken up at the December meeting. A full attendance may be expected, and we trust the discussion will be such as to contribute very materially to the general fund of information upon this topic, as well as to the usefulness of the car-builders' monthly meetings. In order that the best results may be realized, it is important that what is said at these meetings should be as unreserved as possible, and at the same time well considered and free from any spirit of personal or business rivalry. The actual facts are what are wanted, so far as they can be ascertained by the results of experience and observation.

An impression prevails among a great many people that car-wheels and axles are not quite as good and safe as they might be, and that defects in their manufacture, originating in poor material, unskillful workmanship, or indifference to the well-being of the traveling public, are the prolific cause of a large proportion of the railway accidents which occur. This

impression, we are inclined to think, is altogether a mistaken one. If it were made compulsory for all railway corporations to report the particulars of every accident so that the actual causes could be known and classified, it would be found, we think, that a very small proportion of them, and especially of those which occur to passenger-trains, are due to broken wheels. Considering the enormous aggregate of the passenger traffic, (saying nothing of freight,) the comparatively small wheel-breakage argues a degree of excellence in their manufacture, and a watchfulness on the part of train inspectors, that are highly creditable to the parties concerned. We known that on our best managed roads a very efficient system of inspection is maintained with respect to passenger-cars. The least defect in a wheel—a suspicious ring, the slightest indication of a crack, a flat place on the tread, or a piece, however small, broken from the flange—is sufficient to cause its removal; and whether defective or not, neither wheels nor axles are allowed to be used under passenger-cars longer than a specified time. They are then transferred to freight service. It is to this commendable precaution, no less than to the general good quality of the wheels, that the remarkable immunity from accident is due. The public enjoy the benefit of this immunity, and, as a rule, do not award the proper credit for the vigilance and care of wheel-makers, car-builders, and others, in providing for their safety; but they are very prompt in posting up the debit side whenever opportunity occurs.

It is not to be denied that the average life of wheels now in use is much less than what it was ten or twenty years ago. This is owing either to a deterioration in quality caused by competition and lower prices, or to the harder service incidental to faster trains, heavier loads, and more continuous wear and tear. Very likely it is due to both. During the era of railroad economy which has now begun and is likely to prevail for an indefinite period, there will be a demand for cheap wheels—cheap in price and relative durability, cheap as respects first cost and long service—and the problem is to meet the demand without detriment to the repute of wheel-makers or increasing the perils of railway traveling.

The Cliff Elliptic Car-Spring.

THE car-truck is a piece of mechanism that should be as perfect in all its parts as skill and ingenuity can make it. Of the many details that enter into its construction, there are none of more importance than the springs which sustain the load and prevent the car-body and its contents from being shaken to pieces by incessant jarring, vibration, and pounding. The springs in their action, and in the essential qualities of strength, elasticity, and durability, must be adapted to the service required. That the ordinary elliptics possess these qualities to a very considerable extent, we are not disposed to deny; but their great weight and corresponding cost have restricted their use almost entirely to passenger-cars; while freight springs are, as a rule, made of cheaper and less durable materials. However desirable a less expensive spring may be for passenger service, it is clear that the style of elliptics now in use can not be permanently superseded by any other kind which does not possess all their distinctive qualities, with the additional advantages of being lighter and cheaper.

That such a spring has been produced, with such qualities and with such additional advantages, is an established fact; and in these days of enforced economy in every department of business, managers of railroads will not fail to appreciate the discovery. The Cliff Elliptic is adapted to both freight and passenger work, and needs only a fair trial to vindicate its superiority, especially on the score of economy. It is lighter than the old style by at least thirty per cent, which is so much less tax upon the motive power and so much less dead weight. It also has equal capacity in every respect, the advantage as regards weight being secured by a better mechanical arrangement of the plates or leaves, so that every pound of steel is utilized to the utmost, with no sacrifice of power or any increased liability of breakage. A long, slow, elastic action is also secured, much superior to that of the old style, and indispensable to the easy riding of passenger-cars. This is not mere assumption or conjecture, but the result of practical demonstration and thorough experimental test.

There are, of course, many excellent mechanics who have a conservative distrust of any thing in the way of innovation upon established practice; but it is not the part of wisdom, in these days of inventive activity, to draw an arbitrary line, and say, This boundary must not be passed; there is nothing further to be discovered in this direction.

Nothing, however, that pertains to such a stubbornly practical piece of mechanism as a modern car-truck, is expected to pass muster on the strength of mere assertion; nor does the Cliff Elliptic ask any such favor. It does, however, claim the privilege of being fairly set to work and of being fairly judged by its performance. This has already been done as far as practicable, considering its recent introduction, and the verdict is that it is an improvement, which, when generally adopted, as it surely will be, by the railroads of the country, will save in the aggregate a very large item of expenditure.

To Contributors and Readers.

WE desire to have it understood that articles contributed to the CAR-BUILDER, and published with the name of the writer attached thereto, express the individual opinions of the writers, and not necessarily our own. We do not suppose the views embodied in such articles will meet with universal approval. This would be too much to expect, considering the great diversity both of opinion and practice in the multitudinous details of railway construction and operation. In saying this, we have reference more particularly to the article by Mr. J. M. Blanchard, on the Lubrication of Railway Rolling-Stock, which appeared in our last issue. We have been informed that, in one instance at least, the tenor of the article is regarded as unduly reflecting upon the intelligence and capacity of railroad officers. That such a construction may be given to some portions of it is very possible, but we do not think any such thing was intended by the writer; and we certainly had no such design in publishing it. We hope those of our readers who are disposed to take issue with Mr. Blanchard, touching his phraseology or his views upon lubrication, will let us hear from them. Our columns are open to discussion upon this and all kindred topics; but in giving place to the favors of contributors we shall be careful to exclude any seeming reflection upon individuals or classes. If we have heretofore been remiss in this very important editorial duty, we shall try and guard against it in future.

THE Kimball Manufacturing Company, of San Francisco, is building six passenger-coaches for the North-Pacific coast narrow-gauge road. The bodies of these cars are 35 feet long and 7½ feet wide.

A HANGING railway-car, suggested by Mr. Bessemer's steamer system, has been tested with success on the Northern Railway of France. Seated in this car, which hangs on elastic springs, the traveler experiences the sensation of a hammock, free from vibrations and bumping. The movement is described as very gentle.

MESSRS. W. C. ALLISON & SONS, of Philadelphia, have on exhibition at the Franklin Institute a great variety of boiler and water-tubes, bolts, nuts, washers, rivets, globe-valves, cocks, etc., which they manufacture. They show specimens of their tubes crushed endwise, and some completely flattened in that way, without breaking. A beautiful series of photographs of cars manufactured by them also forms part of their display.

Car-Builders' Monthly Meeting.

THE regular monthly meeting was held at the Rooms of the Association on Thursday evening, November 19. The attendance was unusually good, embracing many of the leading members of the Association, and others connected with the metal trade and the various branches of iron manufacture.

The PRESIDENT introduced Professor R. H. THURSTON, of the Stevens Institute of Technology, who, in accordance with previous announcement, exhibited and explained the operation of his machine for testing the qualities of metals. His remarks were exceedingly interesting, and were listened to with the closest attention; but as they were in the main explanatory of diagrams showing the results of numerous experiments with different kinds and grades of metals, any thing like a condensed report would afford a very imperfect idea of the value and scope of the information conveyed.

The machine is simple in construction and of quite moderate dimensions. The specimens to be tested are required to be of a uniform size and shape, say 1 inch square and 3¾ inches long, turned down in the middle to a neck 1 inch long and ⅝ in diameter, with a fillet turned out at each end to a radius of $\frac{1}{16}$ inch. These specimens are placed in the machine—one at a time, of course—and subjected to a wrenching or twisting process by means of a lever acting upon one end of them and a weighted arm upon the other. The force of the strain is recorded with the greatest accuracy by a pencil upon the surface of a paper-covered cylinder, thus forming a diagram to which is attached a vertical and horizontal scale which indicates the strength, stiffness, elasticity, ductility, and every essential property of the metal, including homogeneity and tensile strength, this latter having a constant ascertained ratio with tortional resistance. A great variety of specimens were exhibited which had already been acted upon by the tester; also the corresponding diagrams, on a large scale, showing an autograph record of the behavior of each, and the relative differences and characteristics in such a way that a comparison could readily be made.

In regard to the tests of Wood, the Professor stated the results which had been attained. White pine was shown to be soft and deficient in rigidity; the limit of elasticity is quickly reached, and it rapidly loses strength after passing the limit of resistance. Yellow pine is far better in all valuable properties; the sap-wood is equally stiff with the heart, but it reaches the elastic limit sooner. It was to be preferred where rigidity, strength, toughness, and power to resist shocks are desired in combination with lightness. Spruce, while it is less stiff than white pine, excels it somewhat in strength, but it is far inferior to yellow pine. Ash is more deficient in strength and toughness than is generally supposed, and rapidly loses its power of resistance after passing its maximum. Black-walnut is remarkably stiff, strong, and resilient, the diagram of it resembling in form and outline that of oak. Red cedar is very stiff, but is brittle and deficient in strength. Spanish mahogany is both stiff and strong. White oak exhibits less strength than either good mahogany, locust, or hickory, but is exceedingly tough and resilient, yielding slowly until it suddenly gives way. Its resistance to impact is due to lateral cohesion and the interlacing of its tenacious fibres. During a series of experiments with woods, it was noticed that different specimens of the same species were usually much alike in strength and rigidity, and that marked differences were only occasionally noted in elasticity and resilience. With respect to woods, however, the Professor stated that the tester did not in his judgment give as perfectly reliable results with respect to all their peculiar properties as it did with respect to metals. He contemplated the construction of another machine better adapted to woods, which he had no doubt would be entirely reliable.

Specimens of metals brought by those present were then placed in the machine and tested, but we are unable to give the results with sufficient accuracy to warrant their publication.

PROF. THURSTON, in the course of his remarks, referred to a singular phenomenon which had been observed while making some experimental tests in Washington. A piece of iron was being subjected to a tensile strain by means of an eye welded to each end of the piece. When the limit of strength was apparently reached, and a sensible contraction of the circumference indicated that the piece was about to break, the weld holding the eye gave way and caused a postponement of the test until the following day, the eye being in the mean time welded on again. On renewing the test, the iron, instead of parting at the weakened spot as was expected, sustained an additional strain of 20,000 pounds, and then parted at the other end, where no signs of weakness had been visible the day before, showing that the weakened part had actually gained in strength during its period of rest. This was so remarkable that much attention was attracted to it, and subsequent experiments demonstrated that this property of regaining and increasing strength after resting from strain, was possessed by all good irons. Prof. Thurston had himself made experiments of this kind, and exhibited diagrams showing that after iron had, under strain, passed the limit of elasticity and ductility, if the strain was taken off for five minutes even, and then applied again, the line on the chart would indicate an increase of strength. This occurred repeatedly with the same piece of iron; the longer the rest, the more evident was the increase of strength.

MR. D. A. HOPKINS wished to know if in such a case the strain were continued, the increase of strength would be permanent; or whether the metal would finally weaken at the point where the partial separation of the particles had taken place?

PROF. THURSTON replied that that point had not yet been demonstrated, but his theory was that the added strength was permanent.

MR. W. W. SNOW asked if the point in the iron first referred to was not heated during the rewelding, and on being answered by the Professor in the affirmative, said he believed that the renewal of strength was due to the reheating.

PROF. THURSTON said he supposed the reheating might perhaps restore the strength and leave it where it was before; but the fact that it held firm under a much higher pressure, until the iron broke at another point, showed that it was stronger than it was before.

MR. HOPKINS asked if the increase of the strength of iron when manufactured into wire was due to this setting process. He thought these experiments and tests would be productive of valuable results in the manufacture of iron.

PROF. THURSTON said he could give an illustration by relating a recent experience. A gentleman in Pittsburg was engaged in experimenting with Bessemer steel, and sent him (Prof. T.) from time to time specimens to be tested. The results of the tests were sent to the experimenter, but without knowing in what direction the experiments were tending, until one day the gentleman called and said he had succeeded by means of the tests in accomplishing what he wanted, and which was to ascertain what mixtures he must use to increase the ductility of the iron in order to make a better gun-metal. By looking over the diagrams he could see what effect his last mixtures had produced in the iron, and what modifications were necessary, until he had obtained the desired results.

MR. M. N. FORNEY asked how much stronger wire was than the original metal.

MR. HOPKINS replied that he did not know, but it was a great deal stronger. He had some iron sent him which would stand 66,000 pounds to the square inch, and the wire from that grade of iron ran up to 99,000 and 105,000 pounds to the square inch, and he did not know but it would reach 120,000.

MR. W. E. PARTRIDGE said some of the finest wires would more than double the strength of the original iron; and asked if cold rolled shafting would not get some of its stiffness and strength from the process of which they had been speaking.

PROF. THURSTON replied that he presumed it would.

MR. FORNEY inquired if the strength of iron coupling-links on cars was increased by use.

MR. HOPKINS said that the links were so worn by constant use that it would be impossible to tell whether the strength of the iron had increased or decreased, simply because the wear necessarily diminished the strength by diminishing the material. A grass scythe with an edge so brittle that it would break in cutting the brush, etc., growing with the grass, if hung up for a year or two out of doors and allowed to rust, would invariably be found to be in excellent condition when ground up again for use.

PROF. THURSTON said that old chisels that had long been exposed, proved to be very good and very tough. He once found an old corn-knife in a scrap-heap, which held its edge wonderfully well when ground up. He thought the improvement of the metal, when exposed to the weather, might be due to the action of carbon.

MR. PARTRIDGE had read in the *Annual of Scientific Discovery*, for 1855, an account of a series of experiments with some car-axles: a man had taken a set of axles in constant use, and another set that had had long intervals of rest, and compared their mileage, and it was found that the latter rendered longer and heavier service than the former, which were, under the very same circumstances, all the time at work.

MR. F. D. ADAMS thought the improvement of the scythe by exposure was generally known and admitted among farmers; but, of course, no one had any idea as to the cause. He believed the theory to be correct, that it was due to the removal of the carbon.

PROF. THURSTON suggested that it might be partly owing to the fact that, in working the scythe, it received a certain amount of internal strain, and when it was put into the market, it had not been relieved of any of this, but might be, by the means stated, to some extent.

MR. HOPKINS said that in the light of the experiments of the evening, he concluded that if the iron were drawn down under a strain of extreme tension, and in that condition hammered, a still greater compacting of the fibres would occur, and probably a vast increase of strength would be obtained.

PROF. THURSTON.—Hammered under a strain?

MR. HOPKINS.—Yes, sir; distributed over a large surface, and tending to compress the fibres for a long distance.

PROF. THURSTON.—That might be the case. But one thing is a fact; if a piece of metal is heated up to a cherry-heat, and a strain put on it which is about as much as they expect it to bear, and then they take it and break it cool, it will bear a greater tension than they expected, before it will break. The increase of strength is almost always observable, and generally amounts to 10 or 15 per cent. This was shown by the experiments of a committee. They simply strained the iron to the point it ought to bear, allowed it to cool under that strain, and then tested it. The maximum resistance of the material, as they called it, was about 15 or 16 per cent above the resistance as they ordinarily find it, when tested in the usual way.

At the close of the discussion, Mr. Adams moved that a vote of thanks be tendered to Prof. Thurston for his interesting and instructive address, which motion was most cordially agreed to.

MR. FORNEY, having alluded to the importance of bringing together men engaged in both scientific and practical work, Mr. Adams moved that a vote of thanks be tendered to Mr. Forney, for his zealous and successful efforts to this end, which was unanimously agreed to.

The Chairman then introduced Mr. James M. Palmer, of Portland, Me., who explained a plan which he had matured for the better ventilation of passenger-cars, and also providing for a greater uniformity of temperature. This plan will be described in the next number of the CAR-BUILDER.

The meeting then adjourned.

The next meeting will be held on the 17th of December. The subject of discussion will be *Car-Wheels*, being a continuation of the subject from the October meeting.

The Testing of Car-Wheel Iron.

WE are requested to state, for the information of car-wheel manufacturers, that Professor Thurston's testing machine will remain at the Association rooms until after the December meeting; and that any one desiring to have iron tested at the time of such meeting, will prepare and bring the specimens with him. They must be $3\frac{3}{4}$ inches long, 1 inch square, and turned down in the middle to a neck 1 inch long and $\frac{5}{8}$ in diameter, with a fillet of $\frac{1}{16}$ radius at each end. Specimens of cast-iron may be made a little larger in the rough, and then worked down. It is desirable that two or three specimens of each kind of iron should be brought.

New Publication.

THE first number of the *Journal of the Railway Association of America* was published about a month ago and the second number will be issued some time during the present month. It is a quarterly publication, and is designed to embody, in accessible and permanent form, the most important papers in railway literature, relating to the traffic, construction, management, and operation of railways in this country and in Europe. The forthcoming number will contain a Special Report on the Freight Traffic of the Pittsburg, Ft. Wayne, and Chicago Railway, from the year 1865 to 1868 inclusive, by W. P. Shinn; a paper by W. R. Malcolm, on the Management of European Continental Roads; a paper by Capt. H. W. Tyler, on the History and Management of English Railways; an extract from the Fourth Report of the Massachusetts Commissioners, on the Regulation of Fares and Freights by Legislation; a paper on the Best Means of Preventing Railroad Accidents, by J. M. Goodwin, of Cleveland, Ohio; and a paper on Railroad Grade-Crossings, by T. Appleton, C.E. The first number contains 128 pages, and is neatly printed. Published in St. Louis. Price, 75 cents per copy.

O Novo Mundo.

THIS is an elegant monthly periodical printed in the Portuguese language and superbly illustrated. Its special field is the promotion of the industrial interests of Brazil, and particularly with respect to the extension of railroads in that empire, the vast territory and natural resources of which are as yet but imperfectly developed. The aim of the publication is also to extend the trade and business intercourse between Brazil and the United States by the dissemination of information which is reliable and mutually advantageous. In this it has already acquired an established reputation, especially among railway men and dealers in railway material. Published by J. C. Rodrigues, Times Building, Park Row, N. Y. Oliver C. James, Agent in Rio Janeiro.

THE Midland Railway of England has discontinued the use of second-class carriages and reduced the first-class fare one fourth.

ON the 12th ult. a special train was run over the New-Jersey Division of the Pennsylvania Railroad, leaving Jersey City at 8.12 A.M., and reaching West-Philadelphia at 9.57, making the run of 100 miles in one hour and forty-five minutes, the actual time, exclusive of stoppages, being 1.41, or a mile a minute. Commodore Vanderbilt and other railway officials were on board.

Railroad Fire-Engines.

THE Central Pacific Railroad Company employ no less than four fire trains on the mountain route across the Sierra. The first is stationed at Blue Cañon, the second at Emigrant Gap, third at the Summit, and the fourth at Truckee. Each train consists of a locomotive and three or four water-cars. These cars are about the same length as an ordinary freight-car, and formed of two-inch plank; they are very strongly put together, as nearly water-tight as possible, and elevated above the track about four feet. Each car will hold 3000 gallons of water, or not far from 100 barrels —equal in weight to 24,000 pounds. The locomotives are arranged with powerful pumps that throw a steady stream, and do equally as good work as the best steam fire-engines used in any of the large cities. Leather hose three inches in diameter is used, which, when not in use, is wound upon a large reel mounted on one car of each train. These trains are kept in constant readiness to proceed with all possible speed to the locality of the fire, upon the first alarm. All of the 25 miles of shedding between Emigrant Gap and Truckee is thoroughly deluged with water once a week. In sprinkling the sheds, the pipe man stands on the pilot in front of the engine, which moves slowly along at the rate of two miles an hour. In this work five men are sufficient to manage a train. Since the introduction of the fire-alarm telegraph, with 32 different stations between Emigrant Gap and Truckee, the danger of any very disastrous conflagration in the sheds is nearly or quite obviated.

The Loughridge Car-Brake.

A SERIES of experiments were recently made by the Baltimore and Ohio Railroad Company to test the capacity of this brake. The object was to determine in what time and distance a single car could be stopped at high speed in comparison with the old system where the hand-brakes are used, which was determined by drawing the coupling pin and separating two cars from the train. The results were that, when the pin was pulled and the brakeman signaled to apply the brakes, the car with the new system was stopped when running at a speed of forty-eight miles an hour within a distance of 550 feet, and within 13½ seconds time, while with the other car it required 1255 feet distance. Several stops were made, which showed great power and a remarkable uniformity of action in the new brake. Mr. Loughridge claims this as the shortest distance in which a car has ever been stopped with hand-power, as some two hundred feet were required to fully apply the power with a brakeman, and that with this improvement the effectiveness of the air-brake will be proportionately increased.

Lighting Cars with Petroleum Gas.

THE Philadelphia and Reading Railroad Company have commenced the use of petroleum gas on their cars with entirely satisfactory results. The first passenger-car lighted with it ran through with the regular train from Philadelphia to Reading on the night of Oct. 27. The light was brilliant, and the consumption of gas about one-fifth the quantity ordinarily used. The experiment proves that the trouble heretofore experienced in lighting cars with gas has been overcome; for now a sufficient quantity can be carried for a long trip. The Company have constructed works for the manufacture of this gas, in Reading, under the patent of the inventor, and they are in all respects a decided success. It will doubtless soon be introduced upon other roads.

The C. F. Allen Car-Truck.

THIS truck, sometimes known as the California truck, is under the entire control and management of Messrs. Fransioli, Tilney & Mosher, attorneys-at-law, No. 2 Nassau street, N. Y. There are three separate trucks—one of four, one of six, and one of eight wheels—secured by letters patent of the United States. All correspondence in relation thereto should be addressed to the above-named firm.

The Hitchcock Ventilator.

WE have heretofore called attention to this excellent method of ventilating passenger-cars. We know of no device for what is called top-ventilation that is more effective in its working. When the car is in motion, the exhaust and supply go on by a noiseless, self-adjusting process which does not interfere with the comfort of passengers by exposing them to any direct draft. The dust and cinders are also intercepted by an ingenious arrangement which prevents them from being carried into the car along with the in-flowing current of air. The ventilators, both for exhaust and supply, are placed alternately, so that the two co-operate whenever the car moves in either direction. Once in place, they are always in readiness and in working order, requiring no attention from employees and being beyond the control of passengers. They are in successful operation on a number of roads, and are too well known to require any detailed description. See advertisement and illustration, on page ii.

A CAR-WHEEL has been invented that has double flanges, one of them a supplementary flange, which is outside of and immediately connected with the other. The object of the supplementary flange is, in case the ordinary flange should run on top of the rails, to prevent the wheel from leaving the track.

W. P. KELLOGG & CO., of Troy, N. Y., manufacture boring-machines, Cooley's patent whip-racks, counter scales, foundry castings, and the Empire Portable Forge, of which there are 26 different sizes and styles. They also manufacture curry-combs of every description.

THE Richmond and Danville Railroad is building a new car-elevator to be used for changing the gauge of cars. The machine is of a new pattern, designed by Gen. J. D. Imboden, and can raise two cars at once while the trucks are being changed.

A MEETING of locomotive engineers from different roads was held in Chicago, November 24, and resolutions were adopted protesting against any reduction of pay, and stating that the present system of pay, by the trip, is in itself a sufficient reduction, and should be abolished, as it is not a just system.

THE Ohio Falls Car Company, of Jeffersonville, Ind., has made punctually the second payment, amounting to about $100,000, on the extension notes given last winter, at the time of its partial suspension.

THE Housatonic Railroad Company has recently completed a platform-car, which is intended to carry 30 tons as its ordinary load. It is used in transporting blocks of marble from the quarry.

F. E. CANDA & CO., of Chicago, are at present engaged in building street-cars only, but expect to begin on contracts for freight-cars soon. They employ about 40 men.

HASKELL & BARKER, of Michigan City, are filling orders for freight and passenger-cars, and also for a number of coal-cars. The passenger-coaches are for the Chicago and Iowa, Paris and Danville, and Milwaukee and Western Roads.

THE Manchester (N. H.) Locomotive Works are building 35 engines for the Intercolonial, and 16 for the Northern Colonization Railways.

THE Lehigh Valley Railroad will soon equip all its passenger-cars with the Vacuum brake.

THE Cobourg Car Works, at Cobourg, Ont., and the Midland Manufacturing Co., at Port Hope, Ont., are each building 250 cars for the Grand Trunk Railway.

THE Ontario Car Company, at London, Ont., are building 100 gondolas and 200 box-cars for the Grand Trunk Railway.

THE Wason Car Manufacturing Co., of Springfield, Mass., have contracted with the Central Railroad of New-Jersey for the building of 42 first-class day passenger-cars, to be completed by the first of June next.

Facetiæ.

AN exchange, ridiculing the ridiculous county fairs which make efforts at good shows, says that the Clearfield fair consisted of a calf, a goose, and a pumpkin. It rained so hard the first night that the goose swam off, the calf broke loose and ate the pumpkin, and a thief prowling around stole the calf, and that ended the fair.

"YOU are a good little boy," said a Sunday-school teacher to a sturdy lad, "you never use naughty words." "No, I don't," was the honest reply, "but when my big brother takes all the gravy and leaves me all the crusts, I think damn a good deal, I tell you."

"It is a standing rule in my church," said one clergyman to another, "for the sexton to wake up any man that he may see asleep." "I think," returned the other, "that it would be much better for the sexton, whenever a man goes to sleep under your preaching, to wake you up."

A STRONG-MINDED woman in Detroit made the following gentle reply to a politician who had called at her house to get her husband to go down to the polls and vote: "No, sir! He can't go! He's washing now, and he's going to iron to-morrow; and if he wasn't doing any thing, he couldn't go. I run this 'ere house, I do! And if any one votes, it'll be this same woman!"

THE affection of an engineer for his engine was recently shown by Engineer Allen at the time of the recent accident on the Connecticut Valley Road. He crawled out from under the tender, and as soon as he could speak, exclaimed: "Don't let her burn; put on the water," after which he asked if any other persons were hurt.

"YOU must have lived here a long time," said a traveling Englishman to an Oregon pioneer. "Yes, sir; I have. Do you see that mountain? Well, when I came here that mountain was a hole in the ground." The Englishman opened his half-shut eyes.

A TRAVELER stopping over night with a Texan farmer, whose estate was miles upon miles in extent, said to him: "You must have begun life early to accumulate such an estate as this." "Yes," said the farmer, "I began life when I was a mere baby."

A GENTLEMAN of a mechanical turn of mind took off the gas-meter to repair it himself, and put it up again upside down. At the end of the quarter it was proved with mathematical correctness that the gas company owed him eight dollars and fifty cents!

A LOUISVILLE and a Milwaukee man recently visited the House of Commons together, but retired in great confusion and disgust when the members suddenly began to shout "ear, ear."

IT is said that at the close of an Iowa orator's speech the applause was so deafening you could hear a pin drop.

I DON'T see but one reason why that mare can't trot her mile in three minutes—the distance is too great for the time.

A FARMER near this city, who has a fine patch of melons by the roadside, has this admonitory sign chalked out and put up conspicuously in the patch: "Boys, don't take these melons, for they are green, and God sees you."

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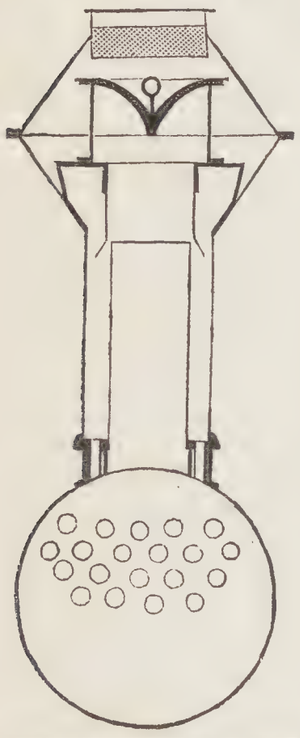

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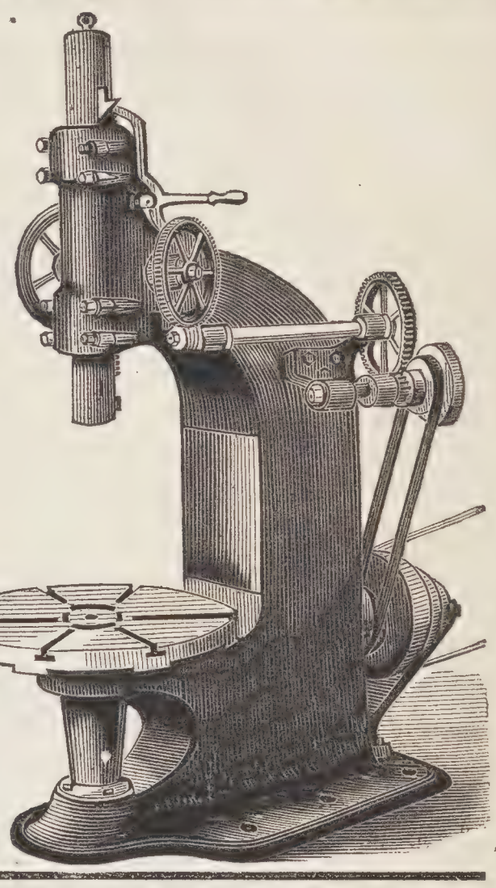

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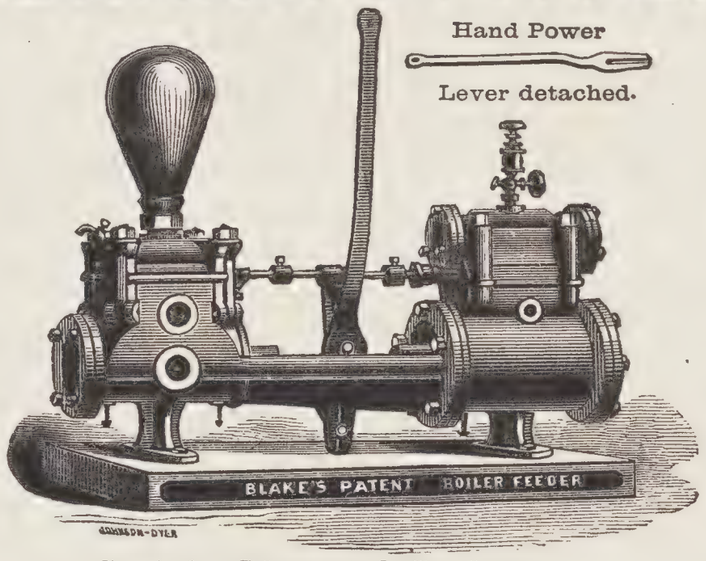

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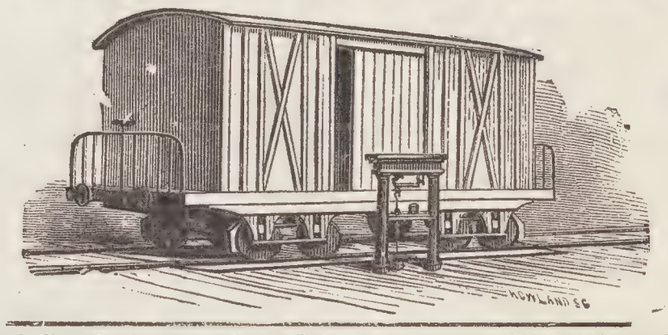

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Barney & Smith Manufacturing Co	Dayton, Ohio.
Baker, Jackson & Co	Latrobe, Pa.
Bellefonte Car Manufacturing Co.	Bellefonte, Pa.
Billmeyer & Smalls	York, Pa.
Bradley, Osgood	Worcester, Mass.
Bridgeport Car-Works	Bridgeport, Pa.
Brill, J. G. & Co	Philadelphia, Pa.
Buffalo Car Co	Buffalo, N. Y.
Canada Car Co	Toronto, Canada.
Canda, F. E. & Co	Chicago, Ill.
Cape Fear Building Co	Abbottsburg, N. C.
Cartersville Car Co	Cartersville, Ga.
Central Car & Manufacturing Co	Jackson, Mich.
Clendenning, W. W	Montreal.
Cummings Car-Works	Jersey City, N. J.
Connellsville Machine and Car Co	Connellsville, Pa.
Corunna Car Co	Corunna, Mich.
De Pere Iron-Works	De Pere, Wis.
Detroit Car-Works	Detroit, Mich.
Detroit Car and Manufacturing Co	Detroit, Mich.
Dawson Manufacturing Co	Dawson, Ga.
Dickey, Neill & Co	Toronto.
Dickson Manufacturing Co	Scranton, Pa.
Erie Car-Works	Erie, Pa.
Elmira Car-Works	Elmira, N. Y.
Frederick & Co	Catasauqua, Pa.
Freas Brothers & Thornton	Berwick, Pa.
Fremont Car Co	Fremont, Ohio.
Gardner, F. & Co.	Carlisle, Pa.
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Gilbert, Bush & Co	Troy, N. Y.
Goold, James & Co	Albany, N. Y.
Goodrich Car Co	Augusta, Ga.
Hannibal Car Works	Hannibal, Mo.
Haskell & Barker Car Co	Michigan City, Ind.
Harrisburg Car Manufacturing Co	Harrisburg, Pa.
Heathcote, Herbst & Co	Glen Rock, Pa.
Hamilton, William & Son	Toronto.
Harlan & Hollingsworth Co	Wilmington, Del.
Herrick Car-Works	Oswego, N. Y.
Huntingdon Car-Works	Huntingdon, Pa.
Indiana Car Co	Cambridge City, Ind.
Indianapolis Car Co	Indianapolis, Ind.
Jackson & Sharp Co	Wilmington, Del.
Jackson & Woodin Manufacturing Co	Berwick, Pa.
Jones, J. M. & Co	West-Troy, N. Y.
Kimball Manufacturing Co	San Francisco, Cal.
Keith, H. T. & I. N	W. Sandwich, Mass.
Laporte Car Manufacturing Co	Laporte, Ind.
Lombard, Thomas	Augusta, Me.
Lebanon Manufacturing Co	Lebanon, Pa.
Lehigh Car Manufacturing Co	Stemton, Pa.
Litchfield Car Manufacturing Co	Litchfield, Ill.
Mansfield Machine-Works	Mansfield, Ohio.
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McNairy, Claflen & Co	Cleveland, Ohio.
Murray, Dougall & Co	Milton, Pa.
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Whittaker, Phillips & Co	Toledo, Ohio.
Wason Manufacturing Co	Springfield, Mass
Weimer, P. L. & Bros	Lebanon, Pa.
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Page viii.

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Atlantic & Great Western	J. A. Cooper	††J. H. F. Wiers	Meadville, Pa.
Atlantic & Great Western	‡William Fuller	D. S. Dockstader	Meadville, Pa.
Atlantic & Great Western	N. Wright	W. G. Haggard	Cleveland, Ohio.
Atlantic & Great Western		S. V. Smith	Kent, Ohio.
Atlantic & Great Western	William Hill	J. W. Holmes	Galion, Ohio.
Atlantic & Great Western	‖J. B. Miller		Shenango, Pa.
Atlantic & Pacific	§§John Hewitt	E. Martin	St. Louis, Mo.
Atlantic, Mississippi & Ohio			
Norfolk & Petersburg Division	J. S. Whitworth	J. S. Whitworth	Norfolk, Va.
South-Side of Virginia "	J. T. Robinett	J. T. Robinett	Petersburg, Va.
Virginia & Tennessee "	F. Sterk	W. A. Morgan	Lynchburg, Va.
Virginia & Kentucky "			
B			
Baltimore & Ohio	§John C. Davis	J. S. Shryack	Baltimore, Md.
Baltimore & Ohio		James H. Miller	Baltimore, Md.
Baltimore & Ohio	Wm. Edwards		Martinsburg, Va.
Baltimore & Ohio	A. J. Cromwell		Piedmont, Va.
Baltimore & Ohio	E. W. Lippencott	H. Longest	Grafton, W. Va.
Baltimore & Ohio			Wheeling, W. Va.
Central Ohio Division	Alex. Platt		Zanesville, Ohio.
S'dusky, Mans., & New'k Div	Wm. Y. Johnson		Sandusky, Ohio.
Bangor, Old Town & Milford	J. B. Peckham	John H. Brown	Bangor, Maine.
Bangor & Piscataquis	Horace Penny	J. W. Comins	Old Town, Maine.
Bellefonte & Snow Shoe	H. D. Landis	H. D. Landis	Bellefonte, Pa.
Belvidere Delaware	R. McDowell	John Silvers	Lambertville, N. J.
Boston & Albany	Wilson Eddy	F. D. Adams	Springfield, Mass.
Boston & Albany	A. B. Underhill		Boston, Mass.
Boston & Albany		W. E. Chamberlain	Allston, Mass.
Boston, Barre & Gardner	John Loyer		Worcester, Mass.
Boston & Providence	George Richards	John Lightner	Roxbury, Mass.
Boston, Clinton & Fitchburg	John Webster	Samuel Stevens	Fitchburg, Mass.
Boston, Concord & Montreal	Ralph Adams	M. R. Elkins	Lake Village, N. H.
Boston & Maine	F. A. Waitt		Boston, Mass.
Boston & Maine		D. C. Richardson	Lawrence, Mass.
Boston, Lowell & Nashua	J. F. Crockett	T. G. Davis	Boston, Mass.
Boston, Lowell & Nashua		S. A. Davis	Nashua, N. H.
Brockville & Ottawa	H. J. Marshall	H. J. Marshall	Brockville, Can.
Brunswick & Albany	M. Thornton		Brunswick, Ga.
Burlington & Missouri River	J. Christiansen		Plattsmouth, Neb.
Burlington, Cedar Rapids & Minn	R. W. Bushnell	R. W. Bushnell	Cedar Rapids, Iowa.
Buffalo, New-York & Phila	Allen Vail		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. J. Bookhammer	John Monks	Oil City, Pa.
C			
Cairo & Vincennes	R. Williams		Cairo, Ill.
California Pacific	A. J. Stevens	D. Rutherford	Vallejo, Cal.
Camden & Amboy	F. B. Stevens		Hoboken.
	T. T. Kerr	E. Lockwood	Bordentown, N. J.
	Thomas Single		South-Amboy.
Camden & Atlantic	Rufus Hill	S. Wills	Camden, N. J.
Canada Southern and Branches	‡‡C. E. Benton	††C. E. Benton	St. Thomas, Canada.
Carolina Central	W. A. Gill	Thos Myers	Laurinburg, N. C.
Catawissa	Wm. Ellis	C. D. Ellis	Catawissa, Pa.
Catasauqua & Fogelsville	Thomas Evans	Chas. J. Holbach	Catasauqua, Pa.
Central of Georgia	D. D. Arden	C. C. Millar	Savannah, Ga
Central of New-Jersey	*T. W. Peeples	George Hackett	Elizabethport, N. J.
Lehigh & Susquehanna Div	L. C. Brastow	L. C. Brastow	Wilkesbarre, Pa.
Central Branch Union Pacific			Atchison, Kansas.
Central R. R. of Iowa		T. L. Scevers	Marshalltown, Iowa.
Central R. R. of Iowa	F. B. Woodruff		Eldora, Iowa
Central Pacific	A. J. Stevens	Benjamin Welch	Sacramento, Cal.
Western Division	Geo. D. Welch	J. J. Lawler	Oakland, Cal.
Visalia Division	S. Johnson		Lathrop, Cal.
Sacramento Division	M. W. Cooley	A. B. Seaman,	Sacramento, Cal.
Truckee Division	James Velsir	C. Lindsay	Truckee, Cal.
Humboldt Division	H. L. Stevenson	Chas. Thompson	Carlin, Nev.
Salt Lake Division	J. G. McCuen	Thos. Turner	Ogden, Utah.
California Pacific Division	D. Rutherford	D. Rutherford	Vallejo, Cal.
Charleston & Savannah	H. T. Calder		Charleston, S. C.
Chesapeake & Ohio	W. G. Freeman	J. N. King	Richmond, Va.
Chesapeake & Ohio	§T. J. Hamer	H. C. Bassinger	Huntingdon, W. Va.
Cheraw & Darlington	D. W. Haines	A. M. Corrie	Florence, S. C.
Champlain Trans. Co.	H. T. Calder		Burlington, Vt.
Cheshire & Ashuelot	F. A. Perry	F. A. Perry	Keene, N. H.
Charlotte, Columbia & Augusta	Robert King	J. C. Troeger	Columbia, S. C.
Chicago & Pacific	A. S. Gurnce		Chicago, Ill.
Chicago & Lake Huron			
Eastern Division	E. Hollis		Port Huron, Mich.
Western Division	W. C. Faulkner		Battle Creek, Mich.
Chicago & North-western	§Geo. W. Tilton	William Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Wm. Campbell	Chicago, Ill.
Wiscon. Mad. & Mill. Divis		Henry Hull	Fond du Lac, Wis.
Galena Division		Hugh Gray	Chicago, Ill.
Iowa Division	C. C. Elliott	Richard Wharton	Clinton, Iowa.
Peninsula Division	Geo. White		Escanaba, Mich.
Chicago & Alton	John A. Jackman	R. Reniff	Bloomington, Ill.
Chicago, Burlington & Quincy	‡Geo. Chalender	††W. W. Wilcox	Aurora, Ill.
Galesburg Division	Wm. Wilson	H. J. F. Small	Galesburg, Ill.
Creston Division	Joel West.		Cresson, Iowa.
Burlington Division	John Bassler		Burlington, Iowa.
Chicago, Clinton & Dubuque	P. R. Sutton		Dubuque, Iowa.
Chicago, Dubuque & Minnesota	P. R. Sutton		Dubuque, Iowa.
Chicago, Rock Island & Pacific	T. B. Twombly	B. K. Verbryck	Chicago, Ill.
Chicago & Michigan Lake Shore	Wm. L. Fitch	D. Sutherland	St. Joseph, Mich.
Chicago, Danville & Vincennes	J. B. Morgan		Danville, Ill.
Chicago, Milwaukee & St. Paul			
La Crosse & P. Du Chien Div		Wm. E. Kittredge	Milwaukee, Wis.
Northern Div		John Bailie	Milwaukee, Wis.
Iowa & Minn. Div	J. Pettee	D. F. Wilson	Minneapolis, Minn.
Hastings & Dakota Division	C. C. Clements		Hastings, Minn.
Cincinnati, Wabash & Michigan	E. M. Porter		Wabash, Ind.
Cincinnati, Hamilton & Dayton	James Eckford	W. H. H. Allison	Cincinnati, Ohio.
Cincinnati & Indianapolis Junction	W. McKinzie	Edwin Beeny	Indianapolis, Ind.
Cincinnati, Lafayette & Chicago	Charles E. Gore		Lafayette, Ind.
Cincinnati & Muskingum Valley	Leroy Kells	Daniel Jewell	Lancaster, Ohio.
Cincinnati, Sandusky & Cleveland	J. M. Sanborn		Sandusky, Ohio.
Cleveland, Col., Cin., & Indianapolis	‡L. S. Young	††William F. Smith	Cleveland, Ohio.
Indianapolis Division	A. R. McAlpine		Galion, Ohio.
Indianapolis Division		R. Attridge	Indianapolis, Ind.
Cincinnati Division	D. Carmichael	D. Carmichael	Delaware, Ohio.
Columbus Division	F. G. Kaufholz	Wm. Cleve	Cleveland, Ohio.
Cleveland and Pittsburg	N. E. Chapman	A. Steinbrunner	Cleveland, Ohio.
Cleveland, Mt Vernon & Delaware	J. W. Holloway	J. W. Holloway	Akron, Ohio.
Cobourg, Peterboro & Marmosa	Wm. Polson		Cobourg, Canada.
Columbus, Chicago & Indiana Central	(See Pitts. Cinn. & St. Louis)		
Columbus & Hocking Valley	H. S. Wallace		Columbus, Ohio.
Concord	Chs. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Portsmouth	C. L. Eastman	M. W. Dickerman	Concord, N. H.
Concord & Claremont	J. N. Lander	A. Langmaid	Concord, N. H.
Connecticut River	§Wm. H. Stearns		Springfield, Mass.
Connecticut Valley	C. W. Hollister	N. A. Smith	Hartford, Ct.
Connecticut Western	N. Slingland		Hartford, Ct.
Contoocook River			Concord, N. H.
Conn. & Passampsic Rivers	Geo. Kilby		Lyndonville, Vt.
Corning, Cowanesque & Antrim	O. C. Patchell	O. C. Patchell	Corning, N. Y.
Cumberland Valley	A. S. Hull	C. W. Nitterhouse	Chambersburg, Pa.
Cumberland & Pennsylvania	W. L. Jordan	Nathan Binnix	Mt. Savage, Md.
D			
Dakota Southern	Jas. Whitney	A. A. Meckling	Yankton, Dak.
Danbury & Norwalk	Charles A. Craig	C. A. Craig	Danbury, Ct.
Davenport & St. Paul	James Russell		Davenport, Iowa.
Dayton & Union	A. J. Keenan	J. F. Feicht	Dayton, Ohio.
Dayton & Michigan	William Cullen	W. H. H. Allison	Cincinnati, Ohio.
Delaware, Lackawanna & Western	Walter Dawson	Robert McKenna	Scranton Pa.
Morris & Essex Division	W. H. Lewis	L. S. Barber	Hoboken, N. J.
Denver & Rio Grande	John Greenwood		Denver, Col.
Detroit, Ft. Wayne & Logansport	W. A. Carpenter		Bankers, Mich.
Detroit & Milwaukee	Andrew Wilson		Detroit, Mich.
Detroit, Lansing & Lake Michigan	Tho. E. Roberts		Ionia, Mich.
Delaware & Hudson CanalCo	‖‖R. C. Blackall		Albany, N. Y.
Dorchester & Delaware			Cambridge, Md.
Dubuque South-western	James Rollo	James Rollo	Farley, Iowa.
Dutchess & Columbia	W. G. Vanbuskirk	H. A. Webster	Fishkill, N. Y.
Dunkirk, Allegheny Val. & Pittsburg	J. C. Haggett	J. C. Haggett	Dunkirk, N. Y.
E			
Eastern		J. P. Somerby	Salem, Mass.
Eastern	John Thompson		East-Boston, Mass.
Eastern Kentucky	D. L. Weaver	D. L. Weaver	Riverton, Ky.
East-Tennessee, Virginia & Georgia	C. A. Hodge		Knoxville, Tenn.
Erie Railway	§§Frank K. Main		Susquehanna, Pa.
Erie Railway	Robert Wallace		Susquehanna, Pa.
Erie Railway	V. Blackburn		Jersey City, N. J.
Erie Railway	F. M. Wilder	M. Wilder	Buffalo, N. Y.
Erie Railway	J. W. Chapman	J. W. Chapman	Hornellsville, N. Y.
Erie Railway		‖D. B. Goodell	Elmira, N. Y.
Erie Railway		‖J. B. Hill	Jersey City, N. J.
Erie Railway	J. Van Vechten	‖J. Van Vechten	Port Jervis, N. Y.
Erie Railway	A. T. Back		Rochester, N. Y.
Erie & Pittsburg	G. J. Parkin	G. J. Parkin	Erie, Pa.
European & North Am. (of Maine)	A. O. Bailey	J. H. Brown	Oldtown, Maine.
Evansville & Crawfordsville	John L. White	Joseph Stiker	Evansville, Ind.
Evansville, Terre Haute & Chicago			Terre Haute, Ind
F			
Fitchburg	Geo. A. Cooledge	Enos Varney	Charlestown, Mass.
Fitchburg & Worcester	John Webster	Samuel Stevens	Fitchburg, Mass.
Flint & Pere Marquette	Sanford Keeler	‖R. B. More	East-Saginaw, Mich.
Florida	Ezra Gray	G. Hernandez	Fernandina, Fla.
Flushing & North Shore	Wm. La Suer	C. Wilkinson	Hunter's Point, L. I.
G			
Galveston, Harrisburg & San Antonio	Palmer Cady		Harrisburg, Texas.
Galveston, Houston & Henderson	Jno. G. Coulon	Wm. Macbeth	Galveston, Texas.
Georgia	William Hardman	T. M. Preval	Augusta, Ga.
Gilman, Clinton & Springfield	W. B. McKenna		Springfield, Ill.
Grand Tower & Carbondale	Hugh Smith	Hugh Smith	Grand Tower, Ill.
Grand Trunk		Warren Noyes	Gorham, Me.
Grand Trunk	†Herbert Wallis	Wm. McWood	Montreal, Canada.
Grand Trunk			Sherbrooke, Can.
Grand Trunk		B. J. Mitchell	Portland, Me.
Grand Rapids & Indiana	J. M. Boon		Fort Wayne, Ind.
Great Western of Canada	†Wm. A. Robinson	F. Childs	Hamilton, Canada.
Green Bay & Lake Pepin	J. H. Erwin		Green Bay, Wis.
Greenville & Columbia	R. H. Anderson	R. H. Anderson	Helena, S. C.
H			
Hackensack & New-York	Abra'm Angausen		Hackensack, N. J.
Hanover Branch	John J. Bingley	Henry Britcher	Hanover, Pa.
Hannibal & St. Joseph	**Jno. MacKenzie		Hannibal, Mo.
Hartford, Providence & Fishkill	Edwin Garfield	V. D. Perry	Hartford, Ct.
Hempfield	T. Marsh		Wheeling, Va.
Housatonic	C. R. Morris	J. J. Ferris	Falls Village, Ct.
Houston & Texas Central	L. C. Noble	Jas. McGee	Houston, Texas.
Huntington & Broad-Top Mountain	W. W. Coller	M. Tellerhoof	Saxton, Pa.
I			
Illinois Central	**S. J. Hayes	H. O. Wadlie	Chicago, Ill.
Chicago Division	Henry Schlacks		Chicago, Ill.
South Division	David Oxley		Centralia, Ill.
North Division	J. B. Edams		Amboy, Ill
Iowa Division	Thomas W. Place		Waterloo, Iowa.
Indianapolis, Cincinnati & Lafayette	J. S. Patterson	S. Griffith	Cincinnati, Ohio.
Indianapolis, Peru & Chicago	John McKenna	John McKenna	Peru, Ind.
Indianapolis & St. Louis	A. J. Sanborn		Mattoon, Ill.
Indianapolis, Bloomington & Western	Tho. V. Losee	A. J. Allen	Urbana, Ill.
Indianapolis & Vincennes	A. E. Allcott		Indianapolis, Ia.
International & Great Northern	R. B. Small		Palestine, Texas.
Intercolonial	Wm. Whitney	Edw. Shaffer	Moncton, N. B.
Iron	Perry Scott	Clem. Roetling	Ironton, Ohio
Ithaca & Athens	F. A. Brown		Ithaca, N. Y.
J			
Jacksonville, Pensacola & Mobile	H. D. Kennedy		Jacksonville, Fla.
Jeffersonville, Madison & Indiana	Reuben Wells		Jeffersonville, Ind
Junction & Breakwater	J. A. Maguire		Lewes, Del.
K			
Kalamazoo, Allegan & Grand Rapids			Kalamazoo, Mich.
Kansas City, St. Joseph & Council Bluff	Wm. D Rowley	Wm. D. Rowley	St. Joseph, Mo.
Kansas Central	John Davis		Leavenworth, Kan.
Kansas Pacific	**L. H. Waugh		Wyandotte, Kansas.
Denver Pacific Div	**L. H. Waugh		Wyandotte, Kansas.
Denver & Boulder Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Junction City & Ft. Kearney Div	**L. H. Waugh		Wyandotte, Kansas.
Arkansas Valley Div	**L. H. Waugh		Wyandotte, Kansas.
Kentucky Central	J. R. Ledyard	J. L. Hackathorn	Covington, Ky.
Keokuk & Des Moines Valley	S. W. Wakefield	M. Sessions	Keokuk, Iowa.
King's Mountain	E. Thomas	E. Thomas	Chester, S. C.
Knox & Lincoln	§§E. R. Hamlin	Benj. Soule	Bath, Maine.
Knoxville & Charleston			Knoxville, Tenn.
Lackawanna & Bloomsburg	Chas. Graham	Chas. Graham	Kingston, Pa.
Lake Erie & Louisville	John Pero		Fremont, Ohio.
Lake Ontario Shore	J. C. Schermerhorn	J. C. Schermerhorn	Oswego, N. Y.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
L			
Lake Shore & Michigan Southern	‡James Sedgley	††John Kirby	Cleveland, Ohio.
Michigan Southern Division	Geo. W. Stevens		Elkhart, Ind.
" " "		S. S. Knapp	Adrian, Mich.
Toledo Division	Geo. H. Tier	Frank O. Bray	Norwalk, Ohio.
Erie Division	L. O. Gassett	J. Withyecombe	Cleveland Ohio.
Buffalo Division	W. L. Wallace	A. C. Robson	Buffalo. N. Y.
Lake Superior & Mississippi	**H. A. Towne		St. Paul, Minn.
Lake Shore & Tuscarawas Valley	W. F. Turreff	J. D. McIlwain	Black River, Ohio.
Lehigh Valley	John I. Kinsey	E. R. Brown, Mauch Chunk, Pa.	South-Easton, Pa.
Lehigh Valley	P. Hofecker		Weatherly, Pa.
Lehigh Valley	A. Mitchell		Delano, Pa.
Lehigh Valley	D. Clark		Hazleton, Pa.
Leavenworth, Lawrence & Gal	S. M. Philbrick		Lawrence, Kansas.
Little Rock & Fort Smith	D. R. Wing	D. R. Wing	Argenta, Ark.
London & Port Stanley			London, C. W.
Louisville, New-Albany & Chicago	Geo. Ruhlandt	Geo. Helfrich	New-Albany, Ind.
Long Island	Chs. A. Thompson	C. A. Thompson	Hunter's Point, L I.
Louisville, Cincinnati & Lexington	E. B. Gibbs	S. S. Pilson	Louisville. Ky.
Louisville & Nashville	†Thatcher Perkins		Louisville, Ky.
Louisville & Nashville	D. P. Rennie	Isaac M. Owens	Louisville, Ky.
Louisville & Nashville	Jas. Montgomery		Bowling Green, Ky.
Nashville & Decatur Division	John Skidmore		Nashville, Tenn.
South & North Ala. Div.	Thos Jeffers	W. L. Gude	Birmingham, Ala.
South & North Ala. Div.	C. H. Beale		Montgomery, Ala.
Memphis & Ohio Div.	Thos. Walsh	R. M. C. Parker	Memphis, Tenn.
Louisville, Paducah & So. Western	W. D. Robb	F. A. Felton,	Elizabethtown, Ky
M			
Macon & Augusta			Macon, Ga.
Macon & Brunswick	R. Wagnon	R. Wagnon	Macon, Ga.
Macon & Western	D. M. Gogel	James A. Knight	Macon, Ga
Maine Central	J. W. Philbrick	J. W. Philbrick	Waterville, Me
Androscoggin Div	Ira K. Russell		Farmington, Me.
Portland & Kennebec Div	John Ellis	C. H. Kenison	Augusta, Me.
Maine Central Division	John F. Merrill.		Waterville Me.
Manchester & Lawrence	Chas. L. Eastman.	M. W. Dickerman.	Concord, N. H.
Marietta, Pittsburg & Cleveland	W. J. Adams		Marietta, Ohio.
Marietta & Cincinnati	E. Bosley	E. Bosley	Chillicothe, Ohio.
Marquette, Houghton & Ontonagon	A. P. Burroughs	H. D. Lyons	Marquette, Mich.
Maryland & Delaware	Samuel Peters		Greensboro, Md.
Memphis & Little Rock	Tho. Rennell	P. Twitchell	Argenta, Ark.
Memphis & Charleston	A. Ross	A W. Drew	Memphis, Tenn.
Memphis & Charleston	H. N. Burford	Fabien Varin	Huntsville, Ala.
Mineral Point	Robert Hay	Robert Hay	Mineral Point, Wis.
Mississippi & Tennessee	Geo. Haszinger	J. Riny	Memphis, Tenn.
Michigan Central	‡A. P. Farrar		Jackson, Mich.
Michigan Central		J. B. Sutherland	Detroit, Mich.
Midland Pacific	A. C. Stiles		Lincoln, Neb.
Milwaukee & Northern		W. J. F. Liddell	De Pere, Wis.
Mississippi Valley & Western	J. S. Pickering		Canton, Mo.
Missouri, Iowa & Nebraska	Wm. Adams		Alexandria, Mo.
Missouri, Kansas & Texas	T. G. Gorman		Parsons, Kan.
Missouri, Kansas & Texas		J. Townsend	Sedalia, Mo.
Missouri, Kansas & Texas	J. E. Wiggins		Hannibal, Mo.
Missouri River, Fort Scott & Gulf	John S. McCrum	Alex. Montier	Kansas City, Mo.
Missouri River, Fort Scott & Gulf		Josiah Stahl	Wyandotte, Kan.
Mobile & Montgomery	James McFarland.	L. Barham	Montgomery, Ala.
Mobile & Girard	C. D. Wall		Girard, Ala.
Mobile & Ohio		John McHugh	Mobile, Ala.
Mobile & Ohio	R. McDougal	I. T. Booth	Whistler, Ala.
Mobile & Ohio	B. S. Herring		Macon, Miss.
Mobile & Ohio	R. H. Briggs		Jackson, Tenn.
Montgomery & West-Point	J. McVey	J. T. Daniels	Montgomery, Ala.
Montgomery & Eufaula	I. W. Hewlet	T. J. Burton	Montgomery, Ala.
Morgan's Louisiana & Texas	N. Tilton	Wm. O'Brien	Algiers, La.
N			
Nashville & Chattanooga	John U. Eastman	J. G. Sawyer	Nashville, Tenn.
Naugatuck	Henry Hanford	George W. Gray	Bridgeport, Ct.
New-Bedford	G W. Reynolds	Robert Chase	Taunton, Mass.
New-Brunswick	P. Logan	C. M. Kinnon	Fredericton, N. B.
New-Brunswick & Canada	Tho. Armstrong	G. Houlton	St. Andrew's, N. B.
New-Haven & Northampton	Henry Fox	Henry Fox	New-Haven, Ct.
New-Jersey Midland	C. J. Clifford.		Wortendyke, N.J.
New-Jersey Southern.	Rufus Blodgett.		Manchester, N. J.
New-Orleans & Ohio	John R. Jordan	John R. Jordan	Paducah, Ky.
New-Orleans, St. Louis & Chicago		‡‡J. D. Billings	McComb City, Miss.
New-Orleans, St. Louis & Chicago	§§L. H. Sellars		Water Valley, Miss.
New-Orleans, Mobile & Texas	H. C. Knapp	D. C. Roland	Mobile, Ala.
New-York, Kingston & Syracuse	A. Q. Mackenbush	G. Dikeman	Syracuse, N. Y.
New-York & Harlem	Wm. M. Strong	C. E. Garey	New-York.
New-York Central & Hudson River		††Leander Garey	New-York.
New-York Central Division	‡G. B. Van Vorst	D. Hoit	West-Albany, N. Y.
New-York Central Division	Henry Watkeys.		Syracuse, N. Y.
New-York Central Division	Amos Gould	James Leary.	Rochester, N. Y.
New-York Central Division	Jas. Butman	Wm. Johnson	Buffalo, N. Y.
New-York Central Division	S. L. White	George Rowe	Niagara Falls, N. Y
Hudson River Division	‡Wm. Buchanan	E. A. Olmstead.	New-York City.
Hudson River Division	R. Greenalch	J. J. Conaghty	E. Albany, N. Y.
New-York, Boston & Montreal		H. A. Webster	Dutchess Junc., N.Y
New-York & Oswego Midland			Oswego, N. Y.
Eastern Division		J. A. Read	Middletown, N. Y.
Middle Division	Tho. Howard		Norwich, N. Y.
Northern Division	Edward Van Vleck.	T. D. Day	Oswego, N. Y.
New-York & New-England	Geo. E. Boyden	Elias E. Pratt	Boston, Mass.
New-York, Providence & Boston.	Jas. H. Anderson.	Jas. H. Anderson.	Providence, R. I.
New-York, New-Haven & Hartford	§§H. Kittendorf	James Denver	New-Haven, Ct.
New-York, New-Haven & Hartford	J. O. Chapman	F. Leppens	Hartford, Ct.
Northern Central	C. M. Lewis		Baltimore, Md.
Northern Central		G. W. Demarest.	York, Pa.
Northern New-Hampshire	James W. Lander.	Albert Langmaid.	Concord, N. H.
Northern of Canada	P. Clark.	P. Clark	Toronto, Can.
Northern Pacific	**H. A. Towne		St. Paul, Minn.
Minnesota Division	W. H. Lewis	W. S. Heathcote	Brainerd, Minn.
Lake Superior & Miss. Div	G. H. Smith	John Hill	St. Paul, Minn.
Dakota Division	C. W. Rossiter		Fargo, D. T.
Pacific Division	J. F. Curtis		Kalama, W. T.
North-Carolina	Rufus D. Wade	B. G. Sergeant	Co. Shops, N. C.
North-Louisiana & Texas	C. H. Tull		Monroe, La.
North-Lebanon		Henry B. Oves	Lebanon, Pa.
North-Pennsylvania	Franklin Roop	Franklin Roop	Philadelphia, Pa.
North-Eastern	D. W. Haines	A. M. Corrie	Florence, S. C.
Norwich & Worcester	Richard Colburn	G. R. Bentley	Norwich, Ct.
O			
Ohio & Mississippi		G. Hibbert	Cochran, Ind.
East Division	A. Thompson		Cochran, Ind.
West Division	H. Elliott		East St. Louis, Ill.
Oil City & Pithole	George Thompson		Pithole, Pa.
Oil Creek & Alleghany River	H. J. Bookhammer.	John Monks	Oil City, Pa.
Old Colony & Newport	J. K. Taylor	A. Gleason	Boston, Mass.
Oregon & California	§§J. Brandt		Portland, Oregon.
Owensburg & Russellville	J. R. Osborne		Owensburg, Ky.
P			
Paducah & Memphis	Alex. Forsyth		Paducah, Ky.
Painesville & Youngstown	G. R. Crane		Painesville, Ohio.
Panama	Chas. E. Stewart		Aspinwall, N. G.
Paris & Decatur	John G. Clifford	G. Clifford	Paris, Ill.
Pacific of Missouri	§§John Hewitt	E. Martin	St. Louis, Mo.
Pennsylvania	§§T. N. Ely		Altoona, Pa.
Pennsylvania	H. D. Garrett	I. W. Van Houten.	W. Philadelphia, Pa.
Pennsylvania	E. L. Caum	Samuel W. Myers.	Harrisburg, Pa.

Railroad.	Master-Mechanic.	Master Car-Builder.	Residence.
Pennsylvania	G. W. Strattan	John P. Levan	Altoona, Pa.
Pennsylvania	D. O. Shaver	R. S. Ramsey	Pittsburg, Pa.
New-Jersey Division		David H. Baker	Jersey City, N. J.
West-Penn. Division	C. B. Street	M. H. Fales	Blairsville, Pa.
Peoria & Rock Island	Geo. Gregg		Peoria, Ill.
Peoria, Pekin & Jacksonville	R. F. Hurd	Jas. J. Doyl	Pekin, Ill.
Petersburg & Weldon	R. B. Andrews	Alex. Wright	Petersburg, Va.
Philadelphia, Wilmington & Baltimore	S. A. Hodgman	Wm. T. Worth	Wilmington, Del.
Philadelphia & Baltimore Central	S. D. Danfield	Samuel D. Danfield	Chester, Pa.
Philadelphia and Erie	Martin Walls		Sunbury, Pa.
Philadelphia and Erie	W. L. Forster		Renovo, Pa.
Philadelphia and Erie	W. L. Holman		Kane, Pa.
Philadelphia and Erie	W. T. Smith		Erie, Pa.
Philadelphia and Erie	§§Howard Fry		Erie, Pa.
Philadelphia & Reading	L. B. Paxson	Aaron Steinbach.	Reading, Pa.
Germantown & Norris'n Div.	Jackson Richards		Philadelphia, Pa.
Pittsburg, Cincinnati & St. Louis	E. Pierce		Dennison, Ohio.
Pittsburg & Columbus Division		Thos. D. Furgusen.	Steubenville, Ohio.
Little Miami Division		M. P. Ford	Columbus, Ohio.
Little Miami Division		J. H. Setchel	Cincinnati. Ohio.
Col., Cin. & Ind. Division	Robert Curtis	Tho. Chamberlin	Columbus, Ohio.
Col., Cin. & Ind. Division	Geo. H. Prescott	Geo. H. Prescott	Logansport, Ind.
Pittsburg & Connellsville	J. E. Sampsel	J. M. Leech	Pittsburg, Pa.
Pittsburg, Fort Wayne & Chicago	S. M. Cummings	John Marquis	Allegheny, Pa.
Pittsburg, Fort Wayne & Chicago	J. M. Boon.	Israel Lee	Fort Wayne, Ind.
Pittsburg, Fort Wayne & Chicago		J. J. Kirkland	Crestline, Ohio.
Pittsburg, Virginia & Charlston	W. Lininger		Pittsburg, Pa.
Pittsburg, Washington & Baltimore	Wm. Stearns.		Connellsville, Pa.
Portland & Rochester	John G. Brady	John G. Brady	Portland, Me.
Portland & Oxford Central	Geo. W. Battles	Geo. W. Battles.	Buckfield, Me.
Portland, Saco & Portsmouth	John Donnell		Portland, Me.
Port Royal	Wm. Campbell	E. Hubard	Port Royal, S. C
Port Hope, Lindsay & Beaverton	H. G. Taylor	H. G. Taylor	Port Hope, Can.
Portsmouth, Gt. Falls & Monmouth	James Tucker	E. Fall	Union Village, N.H.
Poughkeepsie & Eastern	John L. Driscoll	Jerry Wigg	Poughkeepsie, N. Y.
Providence & Worcester	Joseph Kelly	Olney L. Smith	Providence, R. I.
Providence, Warren & Bristol	Rufus Smith	J. Brightman	Bristol, R. I.
Q			
Quincy, Alton & St. Louis	J. O. Gravell	W. G. Gilbert	Quincy, Ill.
Quincy, Missouri & Pacific			Quincy, Ill.
R			
Raleigh & Gaston.			Raleigh, N. C.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Richmond, Fredericksburg & Potomac	H. Kuhn	W. H. Trainham	Richmond, Va.
Richmond, Danville & Piedmont	John McFarland	J. B. Vaughan	Richmond, Va.
Richmond & Petersburg	John O'Brien	H. L. Carter	Richmond, Va.
Richmond & York River	C. H. Harris	J. L. Thompson	Richmond, Va.
Rive De Loup	P. A. Logan	C. R. McKinnin	Fredericton, N. B.
Rome, Watertown & Ogdensburg	Abram Klohs	H. H. Sessions	Rome, N. Y.
Rome, Georgia	O. W. Harbin	O. W. Harbin	Rome, Ga.
Rochester & Genesee Valley	M. E. Brown.	M. Wilder	Buffalo, N. Y.
Rockford, Rock Island & St. Louis	Joseph Elder	T. F. Nolte	Beardstown, Ill.
S			
Saginaw Valley & St. Louis	W. S. Thompson		Saginaw, Mich.
San Antonio & Mexican Gulf	W. T. Bingham		Victoria, Texas.
Savannah & Charleston	P. J. Hutson	J. D. Murphy	Charleston, S. C.
Seaboard & Roanoke	§§M. M. Pendleton		Portsmouth, Va.
Selma & Gulf	Wm. T. Laughtrey.		Selma, Ala.
Selma, Rome & Dalton	A. G. Maynes	W. W. Peirce	Selma, Ala.
Selma, Marion & Memphis	R. H. Anderson		Marion, Ala.
Sheboygan & Fond du Lac	John Hickey	John Hickey	Sheboygan, Wis
Sioux City & Pacific	C. H. Foster		Missouri Val., Iowa.
Southern Pacific of California	J. P. Wilson	F. N. Bellisle	San Francisco, Cal.
South-Carolina	W. B. Smith	John Reed	Charleston, S. C.
Southern Central	Chas. G. Brown.	H. Mooney	Auburn, N. Y.
Southern, of Long Island	Mark Brear	C. Wilkinson	Brooklyn, N. Y.
Southern Minnesota	James Waters		Wells, Minn.
South-Western of Georgia	C. D. Wall		Columbus, Ga.
South-Western of Georgia	D. M. Gogel	James A. Knight	Macon, Ga.
South Shore	Warren E. Ray		Cohasset, Mass.
South Side of Long Island	A. P. Doane	A. P. Doane	Williamsburg, L. I.
Spartanburg & Union	J. N. Benner	Jacob Rice	Union C. H., S. C.
Springfield, Athol & Northeastern	W. E. Granger		Springfield, Mas.
Springfield, Illinois & So. Eastern	John W. Warren		Pana, Ill.
Stanstead, Shefford & Chambly	W. H. Smith		Waterloo, C. E.
Stockton & Ione		W. T. Hoyt	Stockton, Cal.
Stonington & Providence	J. H. Anderson.	J. H. Anderson	Providence, R. I.
St. Croix & Penobscot	Edward Bolton	A G. Page	Milltown, Me.
St. Joseph & Denver City	E. Sleppy		St. Joseph, Mo.
St. Lawrence & Ottawa	Calvin Dame	Calvin Dame	Prescott, Canada.
St. Louis, Iron Mountain & Southern	O. A. Haynes	Oscar Doolittle	Carondelet, Mo.
Arkansas Division	L. Finlay	L. Finlay	Little Rock, Ark.
St. Louis, Vandalia, T. Haute & Ind.	C. R. Peddle	H. Kirmse	Terre Haute, Ind.
Indianapolis Division	Wm. Riley		Terre Haute, Ind.
Vandalia Division	A. J. Sanborn.		Effingham, Ind.
St. Louis, Alton & Terre Haute.	**Beriah Warren		St. Louis, Mo.
St. Louis & South-Eastern	‖L. B. Salisbury		Mt. Vernon, Ill.
Nashville Division	‖H. H. Osborne		Edgefield, Tenn.
St. Paul & Pacific	J. C. Monroe	T. W. Heathcote	St. Paul, Minn.
St. Paul & Sioux City	F. C. Butterfield	J. W. Lydic	Shakopee, Minn.
St. Louis, Kansas City & Northern	W. H. Selby	C. S. Buck	Moberly, Mo.
Sullivan & Erie			Tonawanda, Pa.
Syracuse, Binghamton & New-York	H. H. Dawson	David Burling	Syracuse, N. Y.
Syracuse Northern	W. Garrison	L. W. Smith	Syracuse, N..
T			
Terre Haute & Indianapolis	C. R. Peddle	H. Kirunse	Terre Haute, Ind.
Tennessee & Pacific	William McKeand.	William McKeand.	Nashville, Tenn.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	J. A. Hanglin		Marshall, Texas
Tioga	Peres Bonny	D. H. Stratton	Blossburg, Pa.
Toledo, Peoria & Warsaw	W. O. Hewitt	R. M. Hemphill	Peoria, Ill.
Toledo, Wabash & Western	§J. B. Morse		Fort Wayne, Ind
Toledo, Wabash & Western	‖R. B. Small		Lafayette, Ind.
Toledo, Wabash & Western	Jacob Johann		Springfield, Ill.
Toledo, Wabash & Western		U. H. Kohler	Toledo, Ohio.
Toronto, Grey & Bruce.	Wm. Bowstead		Toronto, Can.
Toronto & Nipissing	J. Haggus		Toronto, Canada.
Troy & Boston	Foster Church	R. V. Coon	Troy, N. Y.
U			
Union Pacific	§I. H. Congdon	‡‡Geo. E. Stevens	Omaha, Nebraska.
Eastern Division		‖A. M. Collett	Omaha. Neb.
Eastern Division		‖H. P. Makely	Grand Island, Neb.
Mountain Divison		‖Jno. E. Davis	Cheyenne, W. T.
Laramie Division		‖Floyd Heavaner	Laramie, W. T.
Western Division		‖C. A. Phipps	Evanston, U. T.
Utah Central	Thos. Pierpont	Thos. Pierpont	Salt Lake City.
Utica & Black River	John Bailey	David James	Utica, N. Y.
Utica, Chenango & Susquehanna	C. H. Brown		Utica, N. Y.
V			
Vermont Central	J. M. Foss	J. M. Foss	St. Albans, Vt.
Harlem Extension Div	C. S. Clapp	C. S. Clapp	Bennington, Vt.
New-London Northern Division	J. W. Dow	S. W. Caulkins	New-London, Ct.
Ogdensburg & L. Champlain Div.	William A. Short	J. R. Ames	Malone, N. Y.
Rutland Division	N. L. Davis		Rutland, Vt.
Vermont & Massachusetts	D. T. Davis	Jacob Marsh	Fitchburg, Mass.
Vicksburg & Meridian	Jas. B. Browne		Vicksburg, Miss.
W			
Wash. City, Va. Midland & Gr. Southern			Alexandria, Va.
Washington & Ohio	Edward Dunn	Joshua Harrison	Alexandria, Va.

Railroad.	*Master-Mechanic.*	*Master Car-Builder.*	*Residence.*
Welland	James Taylor	James Chase	St. Catharine, C. W.
Westchester & Philadelphia	John Moyer	N. Pawling	Philadelphia, Pa.
Western & Atlantic	John H. Flynn	Wm. Grambling	Atlanta, Ga.
Western Maryland	Wm. Lannan	J. H. Nussear	Union Bridge, Md.
Western North-Carolina	J. D. Hollister		Salisbury, N. C.
Western R. R. N. C	M. W. Atkinson	M. W. Atkinson	Fayetteville, N. C.
Western Union	John Taylor	E. A. Eddy	Racine, Wis.
West-Feliciana	R. C. Brower	Wm. Grawling	Woodville, Miss.
West-Jersey	W. McAllister	C. C. Williams	Camden, N. J.
West-Wisconsin	L. T. Mead	J. L. Adam	Hudson, Wis.
White Water Valley	A. W. Britton		Harrison, Ohio.
Wilmington, Columbia & Augusta	W. H. Turrintine		Wilmington, N. C.
Wilmington & Weldon	John Bissit	John Bissit	Wilmington, N. C.
Wilmington & Western			Wilmington, Del.
Wilmington & Reading	H. M. Missimer		Reading, Pa.
Winona & St. Peter	F. C. Ford	H. L. Preston	Winona, Minn.
Wisconsin Central	G. Campbell		Stevens' P't, Wis.
Worcester & Nashua	Albert Griggs	Albert Griggs	Worcester, Mass

DIRECTORY
OF
Railway Superintendents and Purchasing Agents
THROUGHOUT THE UNITED STATES AND CANADA.

REFERENCES.—* General Manager. † Managing Director. ‡ Ass't. Gen. Supt. § Ass't Supt.

A

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Arkansas Central	James A. Tappan		Helena, Ark.
Alabama Central	John M. Bridges		Montgomery, Ala.
Albany & Susquehanna	*C. F. Young		Honesdale, Pa.
Alexandria & Fredericksburg	E. L. Dubarry		Washington, D. C.
Atchison, Topeka & Santa Fe	G. H. Nettleton	G. H. Nettleton	Topeka, Kansas.
Atchison & Nebraska	J. F. Barnard	C. C. Smith	St. Joseph, Mo.
Alabama & Chattanooga	L. J. Fleming	L. J. Fleming	Meridan, Miss.
Ashtabula, Youngstown & Pittsburg	D. B. McCoy		Pittsburg, Pa.
Atlanta & Richmond Air Line	R. Y. Sage		Atlanta, Ga.
Atlanta & West-Point	L. P. Grant		Atlanta, Ga.
Atlantic & Gulf	H. S. Haines		Savannah, Ga.
Atlantic & North-Carolina	E. G. Stanley		New-Berne, N. C.
Atlantic & Great Western	P. D. Cooper	R. B. Browne	Meadville, Pa.
First Division	J. T. Odell		Meadville, Pa.
Second Division	A. L. Dunbar		
Third and Fourth Division	T. A. Phillips		Galion, Ohio.
Mahoning Division	J. M. Ferris		Cleveland, Ohio.
Atlantic & Pacific	A. A. Talmage	W. H. Patriarche	St. Louis, Mo.
Atlantic, Mississippi & Ohio	Henry Fink		Lynchburg, Va.
Atlantic, Tennessee & Ohio	J. J. Gormley		Charlotte, N. C.
Allegheny Valley	J. J. Lawrence	J. J. Lawrence	Pittsburg, Pa.
Adirondack	C. H. Ballard		Saratoga, N. Y.

B

Baltimore & Ohio	Thos. R Sharp	Benj. Williams	Baltimore, Md.
Central Ohio & Lake Erie Div.	Wm. Walker		Columbus, Ohio.
Baltimore & Potomac	J. N. Dubarry		Baltimore, Md.
Bangor & Piscataquis	M. H. Angel	L. H Eaton	Bangor, Maine.
Boston, Barre & Gardner	I. N. Ross		Worcester, Mass.
Boston, Hartford & Erie	H. A. G. Pomeroy		Boston, Mass.
Boston & Albany	*Wm. Bliss		Boston, Mass
Boston & Albany	C. O. Russell		Springfield, Mass.
Boston & Providence	A. A. Folsom	A. A. Folsom	Boston, Mass.
Boston, Clinton & Fitchburg	*H. A. Blood		Fitchburg, Mass.
Boston, Clinton & Fitchburg	S. A. Webber		Fitchburg, Mass.
Boston, Concord & Montreal	J. A Dodge	Lyon & Vose	Boston, Mass.
Boston & Maine	J. T. Furber	M. E. Wood	Boston, Mass.
Boston, Lowell & Nashua	W. M. Parker		Boston, Mass.
Brockville & Ottawa	H. Abbott		Brockville, Canada.
Brunswick & Albany	C. L. Schlatter		Brunswick, Ga.
Burlington & Missouri River (in Neb.)	C. F. Morse	C. F. Morse	Plattsmouth, Neb.
Burlington, Cedar Rapids & Minnesota	W W. Walker	S. L. Dows	Cedar Rapids, Ia.
Burlington & South-Western	R. T. Hosford		Burlington, Iowa.
Buffalo & Jamestown	P. C. Doyle		Buffalo, N. Y.
Buffalo, New-York & Philadelphia	J. D. Yeomans		Buffalo, N. Y.
Buffalo, Corry & Pittsburg	H. H. Potter	N. M. Whitside	Corry, Pa.

C

Cairo & St. Louis	J. L. Hinkley	C. Ritsema	St. Louis, Mo.
Cairo & Vincennes	Henry L. Morrill		Cairo, Ill.
Camden & Atlantic	§F. A. Lister	J. L. Wendell	Camden, N. J.
Canada Central, Brockville, & Ottawa	H. P. Alden		Brockville, Can.
Canada Southern	*L. D Rucker		Toledo, Ohio.
Canada Southern	Webster Snyder	E. W. Porter	St. Thomas, Ont.
Carolina Central	S. L. Fremont		Wilmington, N. C.
Catasauqua & Fogelsville	C. W. Chapman	C. W. Chapman	Catasauqua, Pa.
Cayuga Lake	J. L. Grant		Ithaca, N. Y.
Central Pacific	A. N. Towne	J. R. Watson	Sacramento, Cal.
Central Pacific	‡John Corning		Sacramento, Cal.
Western Division	E. C. Fellows		Lathrop, Cal.
Visalia Division	E. C. Fellows		Lathrop, Cal.
Truckee Division	Frank Free		Truckee, Cal.
Humboldt Division	R. S. Matteson		Carlin, Nevada.
Oregon Divison	J. A. Fillmore		Sacramento, Cal.
Sacramento Division	J. A. Fillmore		Sacramento, Cal.
Salt Lake Division	R. H. Pratt		Ogden, Utah.
California Pacific Division	A. D. Wilder		Vallejo, Cal.
Central of Georgia	Wm. Rogers	H. Yonge	Savannah, Ga.
Central of Iowa	D. N. Pickering		Marshalltown, Ia.
Central Raiload of New-Jersey	R. E. Ricker	W. S. Holden	Elizabeth, N. J.
Chesapeake & Ohio	W. C. Wickham	J. A. Netherland	Richmond, Va.
Middle Division	H. D. Chapin		Staunton, Va.
Charlotte, Columbia & Augusta	James Anderson		Columbia, S. C.
Cheshire	R. Stewart	H. H. Stone	Keene, N. H.
Chicago & Lake Huron	E. B. Taylor	J. E. Quick	Port Huron, Mich.
Chicago & North-Western	Marvin Hughitt	R. W. Hamer	Chicago, Ill.
Wisconsin & Mill. Division	Arthur A. Hobert		Chicago, Ill.
Peninsula Division	J. B. Mulliken		Escanaba, Mich.
Madison Division	C. A. Swineford		Baraboo, Wis.
Kenosha Division	A. A. Hobart		Madison, Wis.
Galena Division	Edward J. Cuyler		Chicago, Ill.
Eastern Iowa Division	J. S. Oliver		Clinton, Iowa.
Western Iowa Division	John A. Head		Boone, Iowa.
Chicago & Alton	J. C. McMullen	A. V. Hartwell	Chicago, Ill.
Chicago, Burlington & Quincy	R. Harris	H. J. Higgins	Chicago, Ill.
Chicago Burlington & Quincy	‡C. H Hudson		Chicago, Ill.
Eastern and Middle Division	C. H. Chappel		Aurora, Ill.
Galesburg Division	H. Hitchcock		Galesburg, Ill.
Quincy Division	N. D. Munson		Quincy, Ill.
Chicago, Dubuque & Minnesota	C. Harris	F. I. Massey	Dubuque, Iowa.
Chicago & Iowa	C. B. Hinkley		Chicago, Ill.
Chicago & Pacific	*G. S. Bowen	Alfred Penny	Chicago, Ill.
Chicago & Paducah	Q. A. Stephenson	Q. A. Stephenson	Streator, Ill.
Chicago, Rock Island & Pacific	Hugh Riddle	A. Manvel	Chicago, Ill.
Illinois Division	Allen Manvel		Chciago, Ill.
Iowa Division	A. Kimball		Davenport, Iowa.
Chicago & Michigan Lake Shore		Wm. R. Morrison	St. Joseph, Mich.
Chicago, Danville & Vincennes	L. Pearson	C. B. Mansfield	Chicago, Ill.
Chicago, Milwaukee & St. Paul	*S. S. Merrill	—— Slocumb	Milwaukee, Wis.
Chicago, Pekin & Southwestern	W. P. Sisson		Streator, Ill.
Chicago & Canada Southern	D. Edwards		Toledo, Ohio.
Cincinnati, Wabash & Michigan	A. G. Wells		Wabash, Ind.
Cincinnati & Muskingum Valley	C. C. Wait		Zanesville, O.
Cincinnati, Richmond & Chicago	Lewis Williams		Cincinnati, Ohio.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Cincinnati & Martinsville	T. C. Burnside		Franklin, Ind.
Cincinnati & Terre Haute			Terre Haute, Ind.
Cin., Cumberland Gap & Charleston	W. J. Taylor		Knoxville, Tenn.
Cincinnati Hamilton & Dayton	Lewis Williams	P. Hickey	Cincinnati, Ohio.
Cincinnati, Hamilton & Indianapolis	Lewis Williams		Cincinnati, Ohio.
Cincinnati, Lafayette & Chicago	E. H. Waldron	E. H. Waldron	Lafayette, Ind.
Cincinnati, Sandusky & Cleveland	Charles Howard		Springfield, Ohio.
Cleveland, Columbus, Cincinnati & Ind.	E. S. Flint		Cleveland, Ohio.
Indianapolis Division	C. C. Gale		Indianapolis, Ind.
Columbus Division	Robert Blee		Cleveland, Ohio.
Cincinnati Division	R. H. Shoemaker		Cincinnati, Ohio.
Cleveland & Pittsburg	*J. N. McCullough	Wm. Mullins	Pittsburg, Pa.
Cleveland, Mt. Vernon & Delaware	G. A. Jones		Mt. Vernon, Ohio.
Colorado Central	P. J. Nichols		Golden, Col.
Columbus & Hocking Valley			Columbus, Ohio.
Concord & Claremont	George E. Todd		Concord, N. H.
Concord	H.E.Chamberlin	H. E. Chamberlin	Concord, N. H.
Connecticut River	John Mulligan	John Mulligan	Springfield, Mass.
Connecticut & Passumpsic Rivers	Geo. A. Merrill	Geo. Killey	Lyndonville, Vt.
Connecticut Valley	Hiram Fowler		Hartford, Ct.
Connecticut Western	W. H. Yeomans		Hartford, Ct.
Corning, Cowanesque & Antrim	A. H. Gorton	R. J. Burnham	Corning, N. Y.
Cumberland Valley	I. F. Boyd	I. F. Boyd	Chambersburg, Pa.
Cumberland & Pennsylvania	J. A. Millholland		Mt. Savage, Md.

D

Danbury & Norwalk	John W. Bacon		Danbury, Ct.
Dakota Southern	J. R. Meckling	J. R. Meckling	Sioux City, Iowa.
Davenport & St. Paul	N. H. Wood		Davenport, Iowa.
Dayton & Michigan	J. H. Weller		Dayton, Ohio.
Dayton & Union	C. C. Gale		Indianapolis, Ind.
Delaware	H. F. Kenney		Philadelphia, Pa.
Delaware & Hudson	R. Manville		Carbondale, Pa.
Delaware & Hudson Canal Co	*C. F. Young		Honesdale, Pa.
Albany & Susq. Division	H. S. Morse		Oneonta, N. Y.
Rensselaer & Saratoga Div	H. B. Smith		Troy, N. Y.
Delaware, Lackawanna & Western		G.W. B. Cushing	New-York City.
Delaware, Lackawanna & Western	W. F. Halstead		Scranton, Pa.
Morris & Essex Division	Andrew Reasmer		Hoboken, N. J.
Oswego and Syracuse Division	W. B. Phelps		Oswego, N. Y.
Utica, Chenango & Sus Division	George F. Thompson		Utica, N. Y.
Denver & Rio Grande	W. W. Borst	W. S. Jackson	Denver, Col.
Detroit & Bay City	T. B. Sargent	D. A. Waterman	Detroit, Mich.
Detroit and Milwaukee	Andrew Watson	John S. Lorimer	" "
Detroit, Hillsdale & Indiana	W. F. Parker		Ypsilanti, Mich.
Detroit, Eel River & Illinois	A. B. Southard		Denver, Ind.
Detroit, Lansing & Lake Michigan	A. H. Reese	C. D. Childs	Detroit, Mich
Dorchester & Delaware	J. M. Murphy		Cambridge, Md.
Dunkirk, Allegheny Valley & Pittsburg	D. Thayer	C. V DeForest	Dunkirk, N. Y.
Dubuque & South-Western	J. P. Farley		Dubuque, Iowa.

E

East Alabama & Cincinnati	B Boyle		Opelika, Ala.
East-Tennessee, Virginia & Georgia	Joseph Jaques		Knoxville, Tenn.
Eastern (Mass.)		C. W. Pratt	Boston, Mass.
Erie	E. S. Bowen		New-York City.
Erie & Pittsburg	J. M. Kimball		Erie, Pa.
Erie Railway,		Henry Bowman	New-York City.
Erie	P. P. Wright	W. W. Tallman	New-York, N. Y.
Eastern Division	E. O. Hill		Port Jervis, N. Y.
Delaware Division	Benj. Thomas		Port Jervis, N. Y.
Susquehanna & Rochester Div.	C. W. Gardner		Elmira, N. Y.
Western & Buffalo "	R. G. Taylor		Buffalo, N. Y.
Erie & Pittsburg		Wm. Mullins	Pittsburg, Pa.
European & North-American	M. H. Angel	M. H. Angell	Bangor, Maine.
Evansville & Crawfordsville	John E. Martin		Evansville, Ind.
Evansville, Terre Haute & Chicago	Jos. Collett, Jr.		Terre Haute, Ind.

F

Fitchburg	Chas. L. Haywood	John Adams	Boston, Mass.
Flint & Pere Marquette	Sanford Keeler	Geo. C. Cook	East-Saginaw, Mich.
Flushing & North-Shore	I. D. Barton		Hunter's Point, L. I.
Flushing & North-Shore		A. E. Godeffroy	New-York City.
Fort Wayne, Jackson & Saginaw	W. A. Ernst	W. A. Ernst	Jackson, Mich.
Fort Wayne, Muncie & Cin	W. W. Worthington		Fort Wayne, Ind.

G

Galveston, Harrisburg & San Antonio	Hardy Eddins	J. W. Pierce	Galveston, Texas.
Galveston, Houston & Henderson	G. B. Nichols		Galveston, Texas.
Georgia	S. K. Johnson	John Vaughn	Augusta, Ga.
Gilman, Clinton & Springfield	D. H. Conklin		Springfield, Ill.
Grand Rapids & Indiana	*C. E. Gorham		Fort Wayne, Ind.
S. Division	J. M. Matheany		Fort Wayne, Ind.
N. Division	H. D. Wallen, Jr		Grand Rapids, Mich.
Grand Rapids & Indiana	*W. O. Hughart	William Mullins	Pittsburg, Pa.
Grand Trunk	*J. Hickson	John Taylor	Montreal, Canada.
East Division	Henry Bailey		Montreal, Canada.
West Division	W. J. Spicer		Toronto, Canada.
Grand Tower and Carbondale	H. V. Olyphant	Wm. W. Harris	Grand Tower, Ill.
Great Southern of Ga. & Fla	M. H. Alberger		Jacksonville, Fla.
Great Western (Canada)	William K. Muir	Robert Beatty	Hamilton, Canada.
Greenville & Columbia	Thomas Dodamead		Columbia, S. C.

H

Hannibal & St. Joseph	L. W. Towne	A. W. Lamb.. / W. J. Hilton.. / L. W. Morse..	Hannibal, Mo.
Harlem Extension	F. C. White		Rutland, Vt.
Hartford, Providence & Fishkill	Samuel Nott		Hartford, Ct.
Housatonic	H. W. Franklin	D. S. Draper	Bridgeport, Ct.
Houston & Texas Central	J. Durand	W. M. Rice, N.Y.	Houston, Texas.
Southern Division	W. H. Vaughan		Houston, Texas.
Northern Division	M. G. Carey		Corsicana, Texas.
Huntingdon & Broad Top.	J. McKillips	B. A. Knight	Huntingdon, Pa.

I

Illinois Central.	A. Mitchell	O. Ott	Chicago, Ill.
Chicago Division	C. A. Beck		Centralia, Ill.
Northern Division	J. C. Jacobs		Amboy, Ill.
Iowa Division	D. W. Parker		Dubuque, Iowa.
Illinois & St. Louis	W. K. McComas		St. Louis, Mo.
Indianapolis, Bloomington & Western	J. E. Gimperling		Urbana, Ill.
Indianapolis, Cincinnati & Lafayette	Geo. L. Barringer	E. V. Cherry	Cincinnati, Ohio.
Indianapolis & Vincennes	E. W. McKenna		Indianapolis, Ind.
Indianapolis & Vincennes		Wm. Mullins	Pittsburg, Pa.
Indianapolis & St. Louis	S. Woodward	J. W. Morse	St. Louis, Mo.
Indianapolis, Peru & Chicago	C. B. Robinson	D. Macy.	Indianapolis, Ind.
Michigan City Division	E. C. Murphy		La Porte, Ind.
Intercolonial Railway	Lewis Carvell	Sam. Watson	Moncton, N. B.
International & Great Northern	H. M. Hoxie		Houston, Texas.

J

Jacksonville, North-Western & S. E.	E. S. Greenleaf		Jacksonville, Ill.
Jacksonville, Pensacola & Mobile	Robert Walker		Jacksonville, Fla.
Jeffersonville, Madison & Indianapolis		Wm. Mullins	Pittsburg, Pa.
Jefferson, Madison & Indianapolis,	Horace Scott		Louisville, Ky.
Junction & Breakwater	Wm. Groom		Lewis, Del.

K

Kansas Central	W. R. Martin		Leavenworth, Kan.
Kansas City, St. Joseph & Council Bluffs	J. F. Barnard		St. Joseph, Mo.
Kansas Midland	W. W. Fagan		Topeka, Kan.
Kansas Pacific			Kansas City, Mo.
Kansas Pacific		J. L. Woods	St. Louis, Mo.
Kaw Valley Division	O. H. Dorrance		Lawrence, Kansas.
Smoky Hill Division	A. B. Garner		Ellis, Kansas.
Denver Division	C. W. Fisher		Denver, Col.
Kentucky Central	G. H. Pendleton	Geo. P. Bowler	Covington, Ky.
Keokuk & Des Moines Valley	Geo. H. Griggs	Geo. H. Griggs	Keokuk, Iowa.
Knox & Lincoln	C. A. Coombs	Oliver Morse	Bath, Maine.

L

Lackawanna & Bloomsburg	D. T. Bound		Kingston, Pa.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
Lackawanna & Bloomsburg		G.W. B. Cushing.	New-York City.
Lake Erie & Louisville	I. H. Burgoon.		Fremont, Ohio.
Lake Ontario Shore	George Bennett		Oswego, N. Y.
Lake Shore & Tuscarawas Valley	W. W. Card	W. L. Holden	Cleveland, Ohio.
Lake Superior & Mississippi	G. H. Smith		St. Paul, Minn.
Lake Shore & Michigan Southern	Charles Paine	A. C. Armstrong.	Cleveland, Ohio.
Kalamazoo Division	William Wheaton		Kalamazoo, Mich.
Detroit Division			
Lansing Division			
Leavenworth, Lawrence & Galveston	B. S. Henning	Allan Bourne	Lawrence, Kan.
Lawrence & South-Western	R. B. Gemmell.	R. B. Gemmell.	Lawrence, Kan.
Lehigh Valley	Robert H. Sayre		Bethlehem, Pa.
		L. Chamberlin	Philadelphia, Pa.
Beaver Meadow Division	A. G. Brodhead, Jr.		Mauch Chunk, Pa
Mahony Division	James I. Blakslee		Mauch Chunk, Pa.
Wyoming Division	A. Mitchell		Wilkesbarre, Pa.
Little Rock & Fort Smith	T. Hartman		Little Rock, Ark.
Logansport, Crawfordsville & S. W.	F. N. Finney		Terre Haute, Ind
Long Island	L. D. Morford	Oliver Charlick.	Hunter's Point, L.
Louisville & Nashville & G. Southern	Albert Fink	G. C. Breed	Louisville, Ky.
Clarksville Division	Jas. Montgomery		Bowling Green, Ky.
Memphis Division	J. T. Flynn.		Memphis, Tenn.
Nashville & Decatur Division	D. F. Whitcomb		Nashville, Tenn.
So. & North Ala. Division	Robert Meek		Birmingham, Ala.
Louisville, Cin. & Lexington	Sam. Gill	E. C. McMichael.	Louisville, Ky.
Louisville, New-Albany & Chicago	John L. Day	J. R. Parker.	New-Albany, Ind.
Louisville, Paducah & Southwestern	D. F. Whitcomb	D. F. Whitcomb	Louisville, Ky.
M			
Macon & Brunswick	J.W. Robertson	J. W. Robertson.	Macon, Ga.
Macon & Western	Capt. G. I. Foreacre		Atlanta, Ga.
Maine Central	L. L. Lincoln	G. A. Phillips	Augusta, Me.
Androscoggin Division	A. Brown.		Lewiston, Me.
Manchester & Lawrence	H. E. Chamberlin		Concord, N. H.
Marietta & Cincinnati	W. W. Peabody		Cincinnati, Ohio.
Marietta, Pittsburg & Cleveland	Jas. McArthur	R. B. Hoover	Marietta, Ohio.
Marquette, Houghton & Ontonagon	*Samuel Schoch.	S. Schoch.	Marquette, Mich.
Maryland & Delaware	J. L. Caldwell.	J. L. Caldwell.	Easton, Md.
Memphis, Carthage & North-Western	E. H. Brown		Carthage, Mo.
Memphis & Little Rock	W. B. Greenlaw.	J. D. Darden	Memphis, Tenn.
Memphis & Charleston	W. J. Ross	J. B. Galloway	Memphis, Tenn.
Michigan Central	W. B. Strong		Chicago. Ill.
Michigan Central	‡J. R. Ledyard	John Newell	Detroit, Mich.
Grand River Valley Division	C. B. Bush		Grand Rapids, Mich.
Jackson, Lansing & Saginaw Div.	C. B. Bush		Saginaw City, Mich.
Michigan Lake Shore	Chas. E. Gorham		Fort Wayne, Ind.
Michigan Lake Shore	P. S. O'Rourke		Monteith, Mich.
Midland Railway of Canada	H. G. Taylor.		Port Hope, Ont.
Midland Pacific	J. N. Converse	M. A. Showers.	Nebraska City, Neb.
Milwaukee, Lake Shore & Western	H. G. H. Reed		Milwaukee, Wis.
Western Division	J. S. Buck		Appleton, Wis.
Mineral Point	G. W. Cobb.	G. W. Cobb	Mineral Point, Wis.
Mississippi & Tennessee	M. Burke	M. Burke	Memphis, Tenn.
Mississippi Valley & Western	Guy Wells.		Quincy, Ill.
Missouri, Iowa & Nebraska	Col. Henry Hill		Warsaw, Ill.
Missouri, Kansas & Texas		G. M. Babcock.	Sedalia, Mo.
Cherokee Division	L. S. Hamilton		Parsons, Kansas.
Choctaw Division	S. G. Eddy		Dennison, Texss.
Missouri Division	J. J. Frey		Sedalia, Mo.
Sedalia Division	J. J. Frey		Sedalia, Mo.
Neosho Division	L. S. Hamilton		Parsons, Kansas.
Osage Divsion	C. M. Sheafe		Holden, Mo.
Missouri Pacific	A. A. Talmage	W. H. Patriarche.	St. Louis, Mo.
Missouri River, Fort Scott & Gulf	B. S. Henning	Allan Bourn	Kansas City, Mo.
Mobile & Ohio	A. L. Rives	C. E. Rushing	Mobile, Ala.
Alabama Division	Cecil Fleming		Mobile, Ala.
Mississippi Division	E. S. Hosford		Macon, Miss.
Tenn. & Ky. Divis on	G. W. Robertson		Jackson, Tenn.
Mobile & Girard	W. L. Clark		Columbus, Ga.
Mobile & Montgomery	G. Jordon	G. Jordon	Montgomery, Ala.
Montgomery & Eufaula	B. Dunham	B. Dunham	Montgomery, Ala.
Morgan's Louisiana & Texas		C. A. Whitney & Co.	New-Orleans, La.
N			
Nashville, Chattanooga & St. Louis	J. W. Thomas	L. P. Barnes	Nashville, Tenn.
Naugatuck	G. W. Beach		Bridgeport, Ct.
New-Brunswick & Canada		Tho. H. Street	St. Andrews, N. B.
New-Brunswick & Canada	John Stewart		St. Stephens, N. B.
New-Bedford & Taunton	Warren Ladd		New-Bedford, Mass.
New-Haven & Derby	E. S. Quintard		New-Haven, Ct.
New-Haven & Northampton	C. N. Yeamans	C. N. Yeamans	New-Haven, Ct.
New-Haven, Middletown & Willimantic	W. A. Waterbury.	W. A. Waterbury.	Middletown, Ct
New-Jersey Midland	W. E. Lewis		Wortendyke, N. J.
New-Jersey Southern	*W. S. Sneden		Long Branch, N. J.
New-Orleans & Selma	T. H. Du Puy		Selma, Ala.
New-Orleans, St. Louis & Chicago	*E. D. Frost	S. H. Edgar, V. P.	New-Orleans, La.
New-Orleans, Mobile & Texas	S. N. Scranton		New-Orleans, La.
New-York & Harlem	Chas. M. Bissell.	R. C. Moore	New-York, N. Y.
New-York, New-Haven & Hartford	E. M. Reed	R. N. Dowd	New Haven, Ct.
N. Y. & N. H. Division	John T. Moody		New-York, N. Y.
Hartford Division	C. S. Davidson		Hartford, Ct.
Shore Line Division	W. H. Stephenson		New-Haven, Ct.
New-York, Boston & Montreal	C. L. Kimball		Dutchess Jn., N. Y.
New-York Central & Hudson River	J. Tillinghast		Albany, N. Y.
New-York Central & Hudson River		C. V. DeForest.	New-York.
Eastern Division	Zenas C. Priest		Utica, N. Y.
Syracuse & Rochester Division	G. H. Burrows		Syracuse, N. Y.
Buffalo & Rochester Division	M. W. Torrence		Buffalo, N. Y.
New-York & New-England	H. A. G. Pomeroy		Boston, Mass.
Worcester Division	P. St. M. Andrews		Worcester, Mass.
New-York & Oswego Midland			New-York, N. Y.
New-Jersey Division	G. W. N. Custis		Jersey City, N. J.
Middle Division	H. M. Flint		Middletown, N. Y.
Western Division			Oswego, N. Y.
New-York, Kingston & Syracuse	H. P. Breed		Rondout, N. Y.
New-York, Providence & Boston	A. S. Matthews	A. S. Matthews	Stonington, Ct.
New Brunswick	Tho. Hoben	W. R. Logan	Fredericton, N.B.
Northern Pacific	*C. W. Mead	E. F. Williams	St. Paul, Minn.
Minnesota Division	J. H. Sullivan		Brainerd, Minn.
Northern Pacific Division	*J. W. Sprague		Kalama, W. T.
Lake Superior & Miss. Division	George H. Smith		St. Paul, Minn.
North-Louisiana & Texas	W. R. Gordon		Monroe, La.
North-Pennsylvania	S. W. Roberts	F. A. Cornby	Philadelphia, Pa.
Northern Canada	†F. W. Cumberland		Toronto, Can.
Northern Central	A. R. Fiske		Harrisburg, Pa.
Northern (New-Hampshire)	George E. Todd		Concord, N. H.
North-Eastern (South-Carolina)	F. K. Huger		Charleston, S. C.
O			
Ohio & Mississippi	E. L. Ryder		Cincinnati, Ohio.
Oil Creek & Alleghany River	C. J. Hepburn		Oil City, Pa.
Old Colony	J. R. Kendrick		Boston, Mass.
Omaha & North-Western	J. E. House		Omaha, Neb.
Oregon & California	J. Brandt, Jr.	G. W. Weidler	Portland, Oregon.
P			
Paducah & Memphis	J. W. Wilber		Paducah, Ky.
Paris & Danville	B. F. Matthius		Danville, Ill.
Paris & Decatur	C. G. Mac	P. Campbell	Paris, Ill.
Pennsylvania	G. Clinton Gardner		Altoona, Pa.
Pennsylvania	*Frank Thomson	Enoch Lewis	Philadelphia, Pa.
Philadelphia Division	W. F. Lockard		Philadelphia, Pa.
Middle Division	S. A. Black		Harrisburg, Pa.
Pittsburg Division	Rob't Pitcairn		Pittsburg, Pa.
Tyrone Division	S. S. Blair		Tyrone, Pa.
Bedford Division	S. M. Prevost		Bedford, Pa.

Railroad.	Superintendent.	Purchasing Agent.	Residence.
West Pennsylvania Division	J. McCreighton		Allegheny City, Pa.
Pensacola & Louisville	C. S. Williams		Pensacola, Fla.
Peoria & Rock Island	John R. Hilliard		Peoria, Ill.
Peoria, Pekin & Jacksonville	James F. Kelsey		Pekin, Ill.
Petersburg	* Jas. C. Sprigg	D. R. Dunn	Petersburg, Va.
Philadelphia & Reading	J. E. Wootten	W. S. Wilson	Reading, Pa.
Catawissa & Williamsport Br'ch	George Webb		Pittsburg, Pa.
Reading & Columbia	B. Van Lew		Columbia, Pa.
Lebanon & Tremont	H. W. Tracy		Pine Grove, Pa.
Philadelphia and Baltimore Central	Henry Wood	Henry Wood	Philadelphia, Pa.
Philadelphia & Erie	W. A. Baldwin.		Williamsport, Pa.
Philadelphia & Erie		Enoch Lewis.	Philadelphia, Pa.
Western Division	J. W. Reynolds		Erie, Pa.
Middle Division	Edmund L. Tyler		Renovo, Pa.
Eastern Division	Thomas Gucker		Williamsport, Pa.
Philadelphia, Wilmington & Baltimore	H. F. Kenney		Philadelphia, Pa.
Pithole Valley	J. T. Odell		Pithole City, Pa.
Pittsburg, Cincinnati & St. Louis	S. M. Felton, Jr.	Wm. Mullins.	Pittsburg, Pa.
Pittsburg & Cin. Division	S. M. Felton, Jr.		Pittsburg, Pa.
Little Miami Division	J. D. Ellison.		Cincinnati, Ohio.
Indianapolis & C. Division	D. W. Caldwell		Columbus, Ohio.
Pittsburg, Washington & Baltimore	E. K. Hindman		Connellsville, Pa.
Pittsburg, Ft Wayne & Chicago	*J. N. McCullough.	Wm. Mullins.	Pittsburg, Pa.
Eastern Division	George Webb		Pittsburg, Pa.
Western Division	C. D. Gorham		Fort Wayne, Ind.
Port Royal	R. G. Fleming		Augusta, Ga.
Portland & Ogdensburg	J. Hamilton	John E. Donnell	Portland, Maine.
Portland & Rochester	W. H. Turner	W. H. Turner	Portland, Maine.
Portland, Saco & Portsmouth	Francis Chase.		Portland, Maine.
Portsmouth, Great Falls & Conway	J. W. Sanborn		Portsmouth, N. H.
Portsmouth	H. E. Chamberlin		Concord, N. H.
Poughkeepsie & Eastern	J. A. Perkins	A. W. Cable	Poughkeepsie, N. Y
Providence & Worcester	W. D. Hilton	W. D. Hilton	Providence, R. I.
Providence, Warren & B	Waterman Stone		Providence, R. I.
Q			
Quincy, Alton & St. Louis	N. J. T. Dana	N. J. T. Dana	Quincy, Ill.
Quincy, Missouri & Pacific	J. R. Buchanan		Quincy, Ill.
R			
Raleigh & Gaston	A. B. Andrews	A. B. Andrews	Raleigh, N. C.
Rensselaer & Saratoga	H. A. Fonda		Albany, N. Y.
Richmond, York River & Chesapeake	E. F. Folger	Hugh Graham	Richmond, Va.
Richmond & Danville	T. M. R. Talcott		Richmond, Va.
Richmond, Fred. & Potomac	E. T. D. Myers.	T. L. Courtney	Richmond, Va.
Richmond & Petersburg	Augustus Shaw.		Richmond, Va.
Rockford, Rock Island & St. Louis	R. R. Cable		Rock Island, Ill.
Northern Division	Henry Looseley		Rock Island, Ill.
Southern Division	Geo. L. Walker		Beardstown, Ill.
Rome, Watertown & Ogdensburg	J. W. Moak		Watertown, N. Y.
S			
St. Lawrence & Ottawa	R. Luttreil		Prescott, Can.
St. Joseph & Denver City	*L. D. Tuthill		St. Joseph, Mo.
St. Paul & Pacific	E. Q. Sewell	E. C. Becker	St. Paul, Minn.
St. Paul & Sioux City	J. F. Lincoln	J. F. Lincoln	St. Paul, Minn.
St. Louis, Alton & Terre Haute	W. G. Broughton		St Louis, Mo.
St. Louis, Iron Mountain & Southern	Arthur W. Soper.	W. S. Cuddy	St. Louis, Mo.
St. Louis, Iron Mountain & Southern	*Tho. McKissock		St. Louis, Mo.
St. Louis & South-Eastern	*E. F. Winslow	C. O. Wood	St. Louis, Mo.
St. Louis Division	George S. Winslow		Mt. Vernon, Ill.
Nashville Division	R. H. G. Minty		Nashville, Tenn.
St. Louis, Kansas City & Northern	W. R. Arthur	R. W. Green	St. Louis, Mo.
St Louis Division	W. H. Vaughan		St. Louis, Mo.
Western Division	C. L. Dunham		Kansas City, Mo.
St. Louis, Vandalia, Terre Haute & Ind.	John E. Simpson.		Indianapolis, Ind.
St. Louis, Vandalia, Terre Haute & Ind.	Chas. R. Peddle		Terre Haute, Ind.
Sacramento Valley & P. & S. V.	F. A. Bishop		Sacramento, Cal.
Saginaw Valley & St. Louis	J. B. Gillett	J. B. Gillett	Saginaw, Mich.
San Francisco & Northern Pacific	A. A. Bean	F. H. Gudes	Petaluma, Cal.
San Rafael & San Quentin.	David Nye		San Rafael, Cal.
Savannah & Charleston	C. S. Gadsden		Charleston, S. C.
Seaboard & Roanoke		E. G. Ghio	Baltimore, Md.
Selma, Marion & Memphis	E. W. Rucker	E. W. Rucker	Marion, Ala.
Selma, Rome & Dalton	M. Stanton		Patona, Ala.
Sheboygan & Fond du Lac	L. A. Emerson	L. A. Emerson	Fond du Lac, Wis.
Shenango & Allegheny	A. L. Dunbar		Meadville, Pa.
Sioux City & Pacific	L. Burnett	L. Burnett	Missouri Valley, Ia.
Sodus Point & Southern	H. Van Vleck		Sodus Point, N. Y.
South-Shore	J. R. Kendrick.		Boston, Mass.
South Carolina	S. S. Solomon	A. Mitchell	Charleston, S. C.
Southern Central	Jas. G. Knapp		Auburn, N. Y.
Southern, of Long Island	I. D. Barton		Hunter's Point, L.I.
Southern, of Long Island		A. E. Godeffroy	New-York City.
Southern Minnesota	W. C. Van Horne.		Wells, Minn.
Southern Pacific of California	A. N. Towne		Sacramento, Cal.
Southwestern of Georgia	Virgil Powers		Macon, Ga.
Spartanburg & Union	Thomas P. Jeter		Unionville, S. C.
Springfield, Athol & Northeastern	*G. W. Phelps		Springfield, Mass.
Springfield & North-Western	*A. J. Ware		Pekin, Ill.
Springfield, Illinois & South-Eastern	*C. A. Beecher		Springfield, Ill.
Staten Island	J. W. Wlbur		New-York, N. Y.
Stockton & Ione	W. G. Miller		Stockton, Cal.
Stonington & Providence	A. S. Mathews	A. S. Mathews	Stonington, Ct.
Sullivan & Erie	Wm. Stevenson		Towanda, Pa.
Summit County	W. M. Riter.		Coalville, Utah.
Syracuse Northern	J. W. Moak		Watertown, N. Y.
Syracuse, Binghamton & New-York	T. Voorhees	G. W. B. Cushing.	Syracuse, N. Y.
T			
Tennessee & Pacific	George Maney		Nashville, Tenn.
Terre Haute & Indianapolis	J. E. Simpson		Indianapolis, Ind.
Terre Haute & Indianapolis		C. R. Peddle	Terre Haute, Ind.
Terre Haute, Paris & Decatur	D. Hitchcock	P. Campbell	Terre Haute, Ind.
Texas & New-Orleans	R. B. Baer		Houston, Texas.
Texas & Pacific	Geo. H. Noble	Wm. Mahl	Marshall, Texas.
Tioga	L. H. Shattuck		Blossburg, Pa.
Toledo, Peoria and Warsaw	W. H. Cruger		Peoria, Ill.
Toledo, Peoria & Warsaw		Oran Ott	Chicago, Ill.
Western Division	David K. Smith		Peoria, Ill.
Western Division	William E. Dorwin		Warsaw, Ill.
Toledo, Wabash & Western		J. T. Sterling	Toledo, Ohio.
Eastern Division	C. W. Bradley		Toledo, Ohio.
Western Division	Robt. Andrews		Springfield, Ill.
Toledo, Canada Southern & Detroit	D. Edwards		Toledo, Ohio.
Troy & Boston	C. W. Moseley		Troy, N. Y.
Toronto, Grey & Bruce	N. Weatherston	W. Watson	Toronto, Can.
Toronto & Nipissing	J. C. Bailey		Toronto.
Tuckerton	J. Naramore		Tuckerton, N. J.
U			
Union Pacific	S. H. H. Clarke	S. H. H. Clarke	Omaha, Neb.
Mountain Division	S. J. Nichols		Cheyenne, Wyom'g.
Laramie Division	S. T. Shankland		Laramie, Wyoming.
Western Division	O. H. Earll		Evanston, Wyoming.
Utah Central & Southern	John Sharp	S. H. Hill	Salt Lake City.
Utica & Black River	J. F. Maynard		Utica, N. Y.
Utica, Ithaca, & Elmira	H. P. Goodrich		Ithaca, N. Y.
V			
Vermont & Mass. & Troy & G	O. T. Ruggles	O. T. Ruggles	Fitchburg, Mass.
Vermont Central	J. W. Hobart		St. Albans, Vt.
Western Division	John Schrier		Ogdensburg, N. Y.
Central & Southern Division	Ambrose Arnold		St. Albans, Vt.
Northern & Eastern Division	G. L. Stone		" " "
Rutland Division	J. Burdett		Rutland, Vt.
New-London Northern	G. W. Bentley		New-London, Ct.

Railroad.	*Superintendent.*	*Purchasing Agent.*	*Residence.*
Vicksburg & Meridian	E. F. Raworth		Vicksburg, Miss.
Washington & Ohio	R. H. Havener	Lewis McKenzie	Alexandria, Va.
Welland	William Pay		St. Catherine, Ont.
Westchester & Philadelphia	Henry K. Smith	J. J. Bryant	Philadelphia, Pa.
West-Wisconsin	W. G. Swan		Hudson, Wis.
West-Jersey	W. J. Sewell		Camden, N. J.
Western of North-Carolina	John M. Rose		Fayetteville, N. C.
Western & Atlantic	Wm. McRae		Atlanta, Ga.
Western Maryland	*J. M. Hood		Baltimore, Md.
Western Union	D. A. Olin		Racine, Wis.
White Water Valley	H. M. Britton	H. M. Britton	Cincinnati, Ohio.
Wilmington & Western	David Connell		Wilmington, Del.
Wilmington, Columbia & Augusta	James Anderson	James Anderson	Wilmington, N. C.
Wilmington & Weldon	J. F. Devine		Atlanta, Ga.
Wilmington & Reading	E. Collings	C. Stoltz	Coatesville, Pa.
Winona & St. Peter	S. Sanborn		Madison, Wis.
Winona & St. Peter		R. W. Hamer	Chicago, Ill.
Wisconsin Central			Milwaukee, Wis.
Worcester & Nashua	C. S. Turner.	C. S. Turner.	Worcester, Mass.

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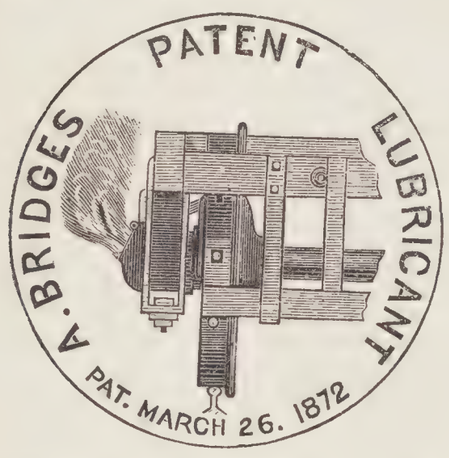
BY THE USE OF



For Railroad Car Journals and other Bearings.

In presenting this Lubricant to the notice of Railroad and Steamboat Managers and Operators in Machinery generally, I do so with a practical knowledge of its merits, and with confidence that it will be found to possess invaluable qualities as a

Lubricator and Counteractor of Friction.

It has been in use, during the past two years, on a number of Railroads and Steamers, and is highly approved of.

Parties wishing to make a practical test of the Lubricant will be furnished with sample on application.

ALBERT BRIDGES, Patentee,

MANUFACTURER AND DEALER IN

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The Lock-Nut and Bolt Co., of New-York,

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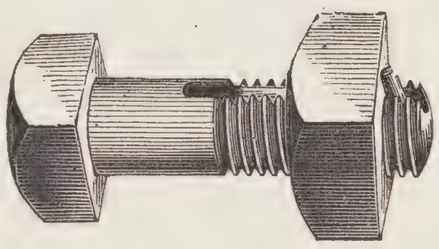
Manufacturers of all kinds of BOLTS, for FISH-PLATES, CARS, BRIDGES, MACHINERY, CARRIAGES, &c., with the

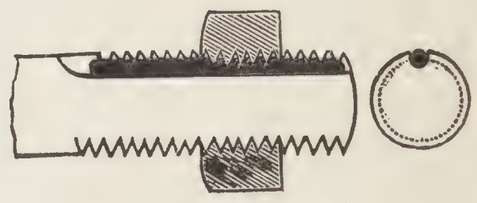


"CUMMING NUT-LOCK,"

Patented

June 16, 1868,

August 23, 1870.



SECTIONS.

Unequaled for CHEAPNESS, SIMPLICITY & EFFECTIVENESS.

This simple device, as will be seen by the engravings, consists of a groove being cut in the threaded part of a screw bolt into which is placed a key of copper wire, or other soft metal; when the nut is screwed on, it cuts a thread on the key, thereby making it impossible for the key to get out until the nut is taken off. When the nut is screwed up to its place, that part of the key over which the nut has passed is riveted up against the nut with a small punch, destroying the thread on the key. The nut, therefore, can not move backward until force is used, as with a wrench.

The groove can be rapidly cut with a simple machine designed for the purpose.

Experience has proved this device absolutely reliable, and it is the cheapest of all known devices for the purpose. By its use, old bolts on which the nuts have become too slack for use can be made as good as new, making it a great saving to railroad companies and others in that item alone. It is cheaper than a check-nut.

If the bolt should become slack from shrinking of timber or other causes, *the nut will always remain firmly attached to the bolt*, and, with the wrench, can be screwed up *any distance*, and the wire riveted up any number of times, or can be taken off without injury to the nut or bolt.

This is the only method in use that locks the nut firmly to the bolt without regard to place or surroundings, all others require some attachment that holds the bolt in its position, and a washer or other attachment to keep the nut from turning.

DIRECTIONS FOR USE.—Place the copper key in the slot, pointed end out, and beveled side up, in such a position that when the nut is screwed to its place about three-eighths of an inch of the key will project beyond its outer face. Then screw the nut to its place *over the key*, allowing it to cut its own thread in the copper. Then take a narrow flat set punch, and rivet the projecting part of the key *solidly* against the outer face of the nut. To tighten the nut: screw it up, and rivet the key tighter. To remove the nut: simply apply the wrench and unscrew the nut. It will cut its own way out through the copper. The same key can be used several times, by moving it outward a few threads in the slot.

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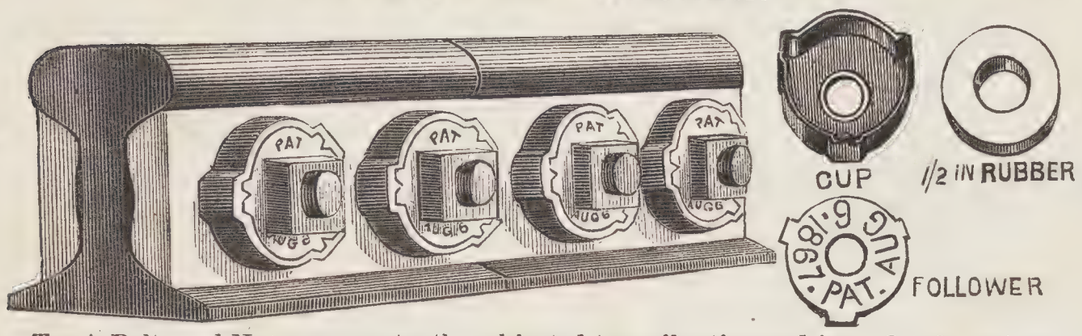
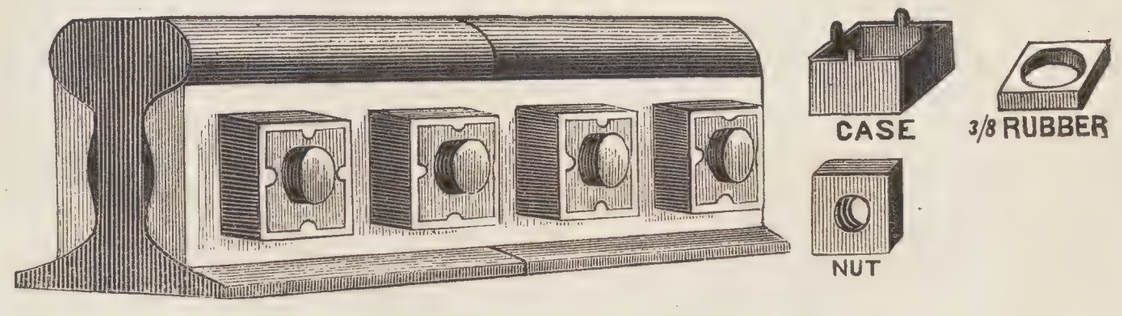
"SPRING CUP-WASHER."



"SPRING NUT."



Track Bolts and Nuts are constantly subjected to a vibration and jar. One large item of expense is for wrench-work and replacement of bolts and nuts already off.

Most of the contrivances for removing this trouble are failures. They do not remove the cause of the trouble. This can only be done by some elastic material, which will absorb the vibration and prevent its reaching the nuts. Experience proves that permanent elasticity can not be obtained by using wood, which is perishable, or steel, which can not be made of uniform temper. In our inventions, the elastic packing of rubber between the nut and the plate absorbs the jar or vibration, insulates the nut, and by removing the cause of the trouble removes the trouble itself. Among its advantages are these:

1st. It saves the expense of wrench-work and loss of nuts.
2d. The rubber absorbs the blow given by the wheels at the joint, in such manner as to prevent fracture of rails at the joint, and accidents resulting therefrom.
3d. The track is made noiseless.
4th. Rails are saved from pounding out at the ends, and the thread of the bolts and nuts from stripping.

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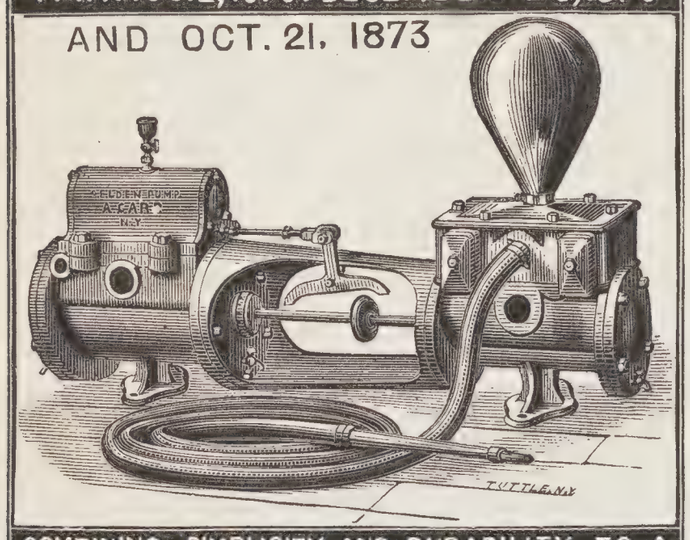

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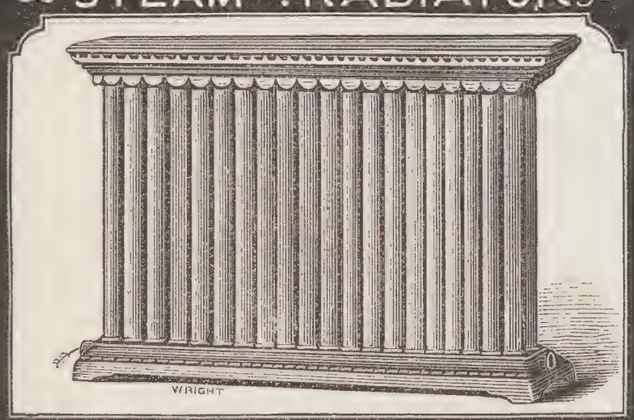

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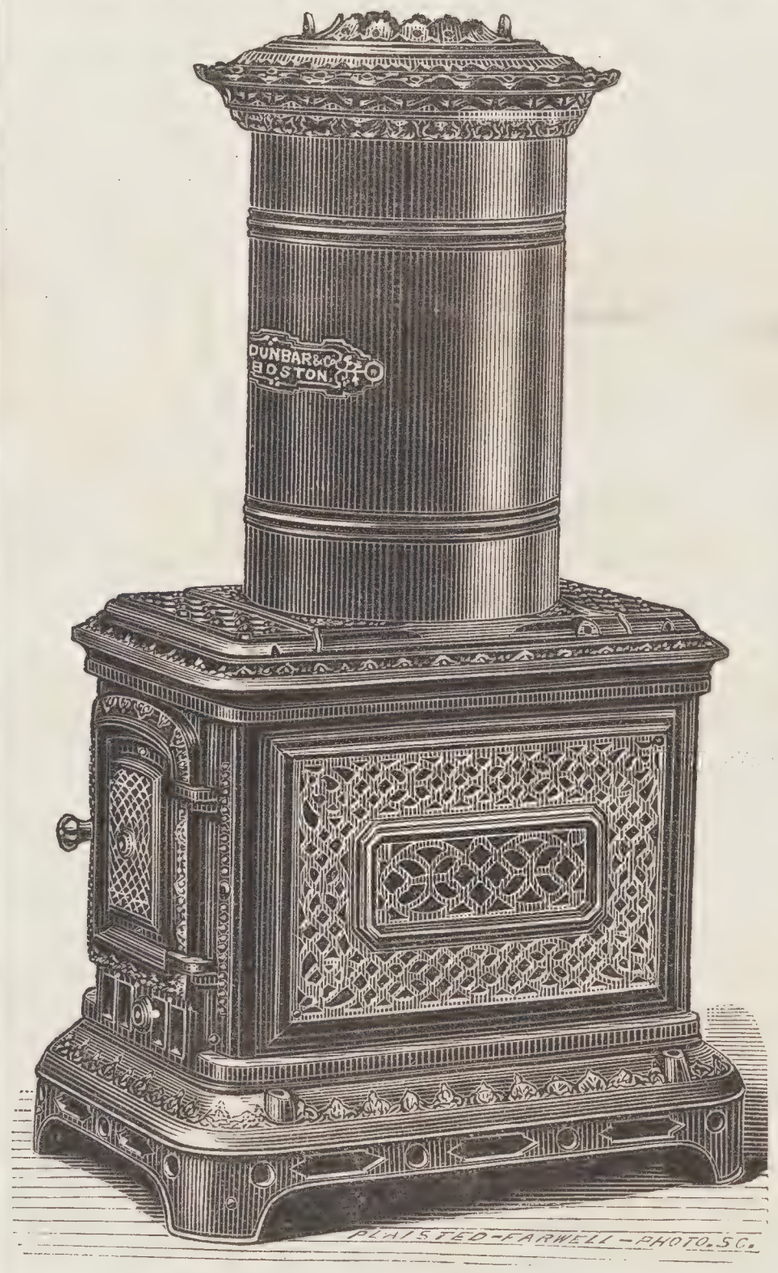

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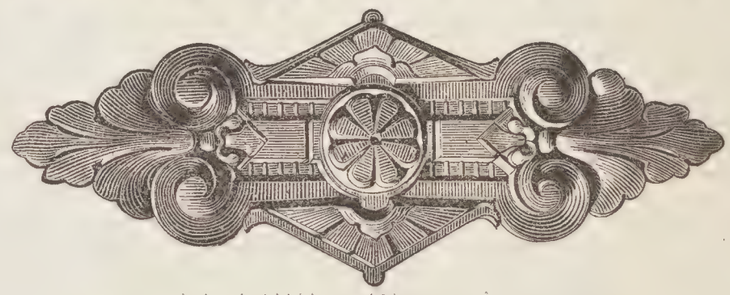

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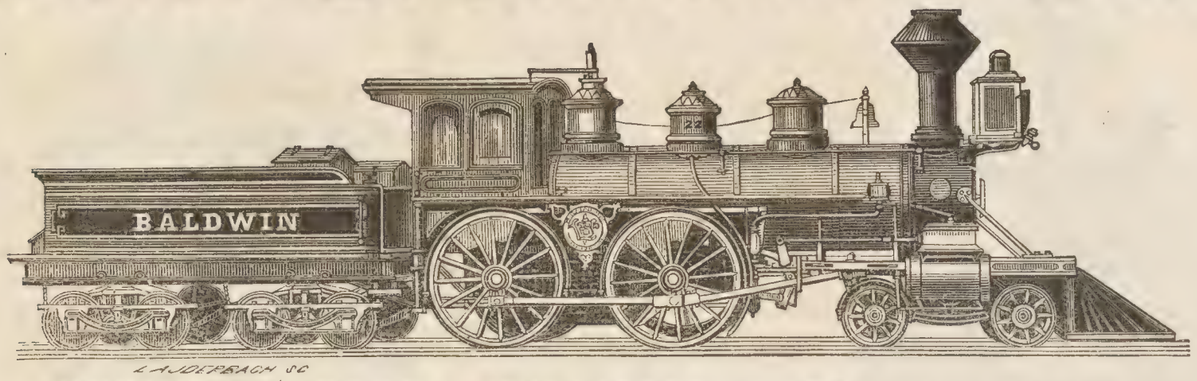

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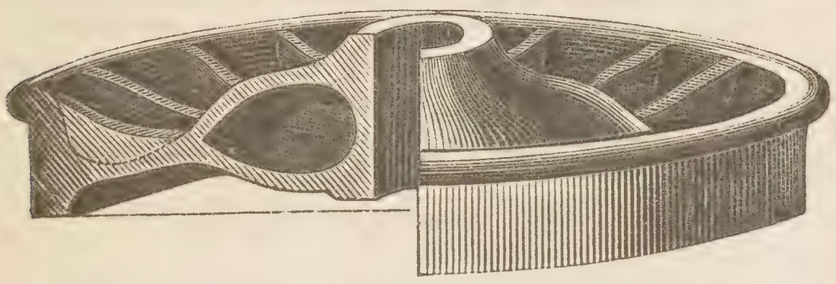

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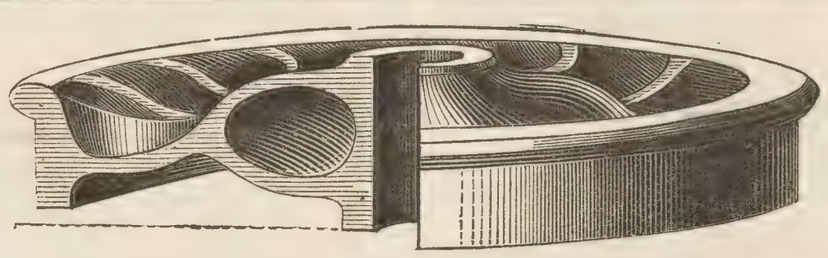

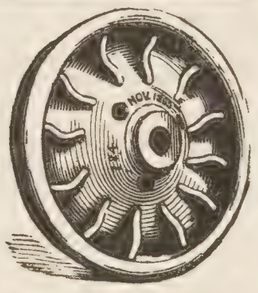

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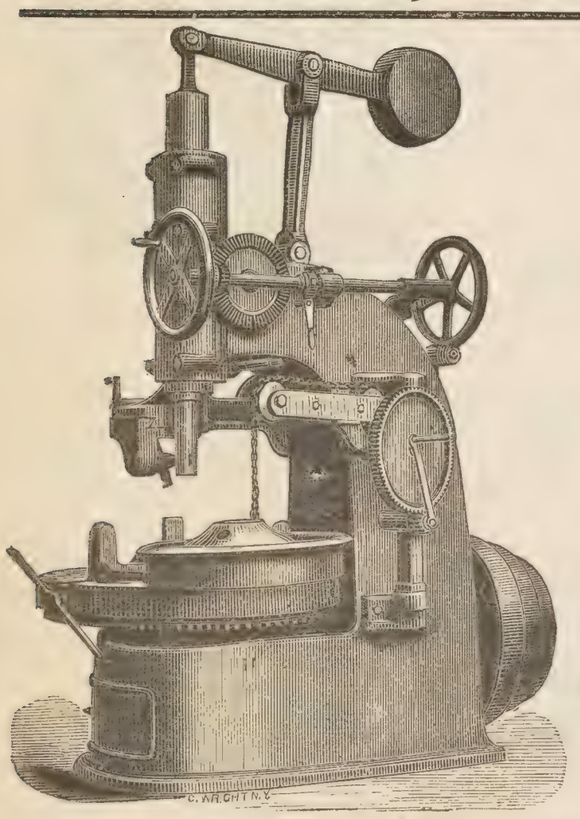

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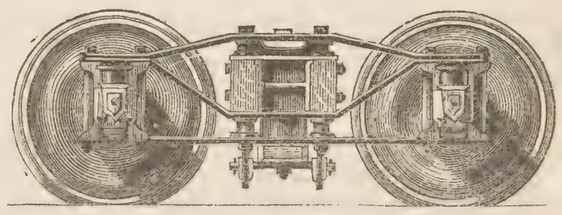

This is a ***Centre-Bearing Swing-Beam Truck,*** and it is reported by the runners and engineers of motive power that the efficiency of such power is increased by the use of this truck from

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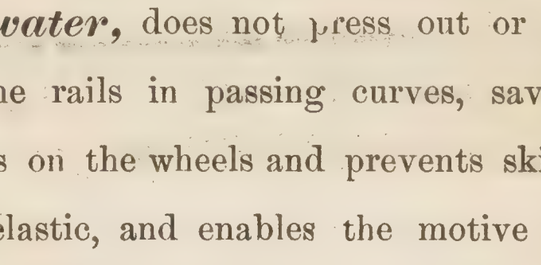
It takes the curve like a boat in the water, does not press out or endanger the rails in passing curves, saves the flanges on the wheels and prevents skidding. It is elastic, and enables the motive power to start with greater ease and with a greater number of cars, the vibration overcoming the inertia or rest upon the track. The leading features of the patent are the mechanical means employed by which the result is obtained. For the mechanical combination, the reader is referred to the patent issued April 24, 1866.



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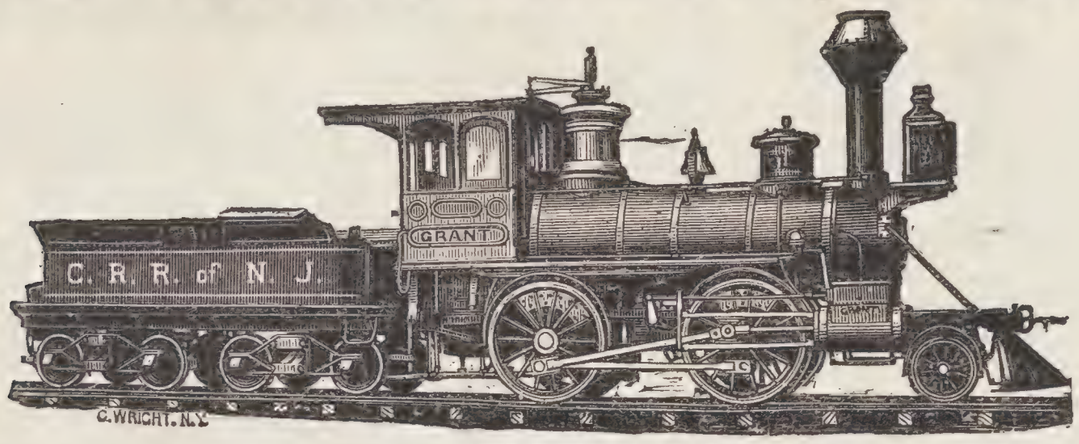

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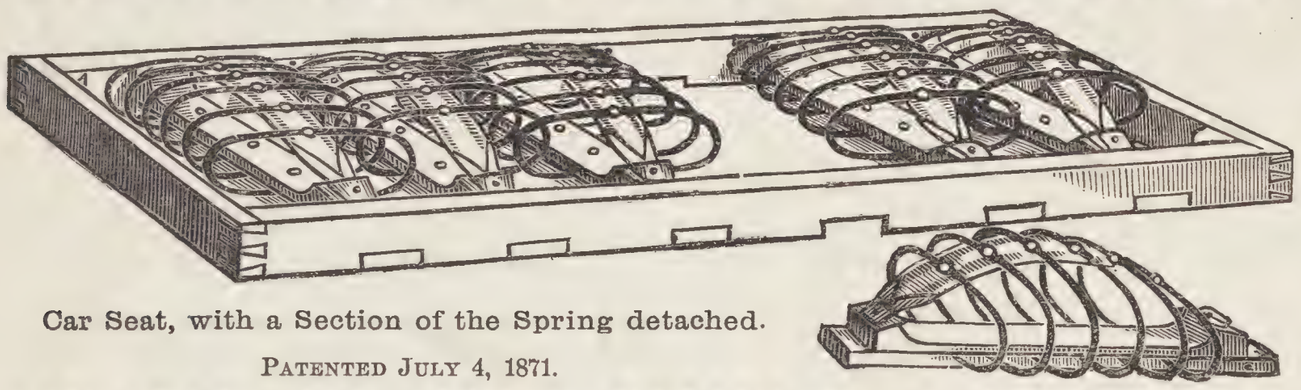

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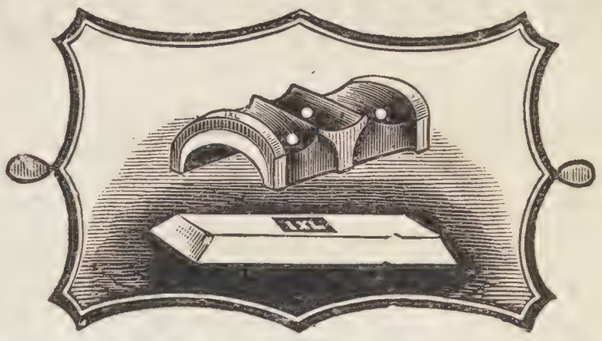

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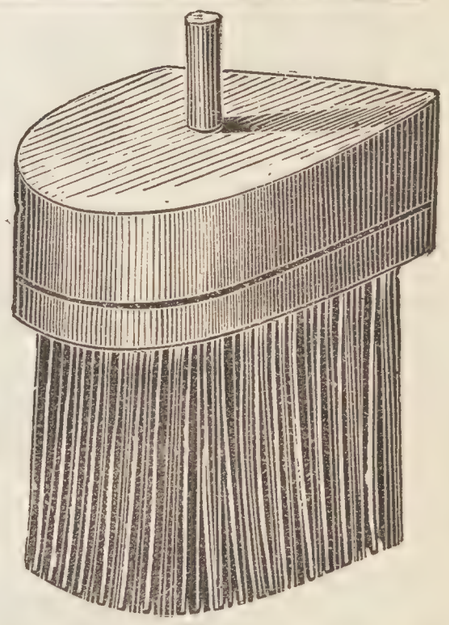

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